Stormwater Best Management Practice Handbook Portal: **Construction**

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

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Acknowledgements

The *Stormwater Best Management Practice Handbooks* are products of the California Stormwater Quality Association (CASQA). The handbooks were originally published in 1993 by the California Stormwater Quality Task Force, the predecessor of CASQA, and subsequently updated in 2003. This 2009 update of the *Construction Handbook* reflects the current state of construction stormwater quality management practices and revised regulatory requirements. An interactive web portal as a platform for the handbooks has also been created http://www.casqa.org

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The development of the *Construction Handbook* was guided by a Steering Committee, a Technical Advisory Committee, and the CASQA BMP Subcommittee. The Steering Committee provided CASQA's direction to the Consultant Team. The Steering Committee included representatives from Phase I and Phase II communities, the United States Environmental Protection Agency (EPA), the SWRCB, the California Department of Public Health, and CASQA. The Technical Advisory Committee included representation from Phase I and Phase II communities, EPA, SWRCB, academia, the building industry, the California Department of Transportation (Caltrans), CASQA, and the International Erosion Control Association (IECA).

Steering Committee

Richard Boon, County of Orange (Phase I)

Eugene Bromley, US Environmental Protection Agency Region IX

Geoff Brosseau, CASQA

Greg Gearheart, PE, State Water Resources Control Board

Kelye McKinney, PE, City of Roseville (Phase II)

Marco Metzger, PhD, California Department of Public Health

Technical Advisory Committee

Anna Lantin, PE, CPESC, CPSWQ, CASQA BMP Sub-Committee Chair

Dennis Ariza, Fairfield-Suisun Sewer District (Phase I)

Eric Berntsen, PH, CPESC, CPSWQ, State Water Resources Control Board

Michael R. Chase, CPESC, CPSWQ, CESSWI, MC Environmental (IECA)

Jeff Endicott, PE, AEI-CASC (CASQA)

Mark Grey, PhD, Construction Industry Coalition on Water Quality; BIA of Southern California

Harlow Landphair, Emeritus, Texas Transportation Institute (Academia)

Chuck Suszko/Tom Huff, California Department of Transportation

Scott Taylor, PE, RBF Consulting (CASQA)

John Tinger, US Environmental Protection Agency Region IX

Consultant Team

This update of the *Construction Stormwater Best Management Practice Handbook* was prepared by Larry Walker Associates and Geosyntec Consultants. The team was led by Mack Walker, PE, Principal-in-Charge. The *Construction Handbook* team consisted of the following consultants and individuals.

Larry Walker Associates

Mack Walker, PE, Principal-in-Charge

Sandra Mathews, Handbook Project Manager

Gorman Lau, PE	Steve Maricle	Brian Laurenson, PE
Amy Storm	Kate Lundberg	Rachel Terpstra

Geosyntec Consultants

Kim Williams, PE, CPSWQ, Handbook Project Manager

Peter Mangarella, PhD, PE	Matt Rea, CPESC	Nathan Jacobsen, PE, CPESC
Kathleen Harrison, PG	Buck Buchanan, CPESC	Christian Braun, CPESC
Jerry Amos	Dan Pankani, PE	Michael Harding, CPESC

EOA, Inc.

Jill Bicknell, PE	Chris Sommers

Michael Barrett, PhD, PE

State Water Resources Control Board

Greg Gearheart, PE	Annalisa Kihara, PE

Eric Berntsen, PH, CPESC, CPSWQ

Disclaimer

The *Stormwater Best Management Practice Handbooks* are intended to provide a range of general information about stormwater quality best management practices and related issues. Due to the multitude of applications of best management practices, the handbooks do not address site-specific applications. Therefore the users of the handbooks must seek advice of a stormwater quality professional to determine the applicability of the information provided for any general use or site-specific application. Users of the handbooks assume all liability directly or indirectly arising from use of the handbooks.

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Section 1
Introduction

Stormwater runoff is part of the natural hydrologic process. However, human activities such as urbanization and construction can impact stormwater runoff. If not carefully managed, construction activities can affect water quality, adding pollutants to rivers, lakes, and streams as well as coastal bays and estuaries, and ultimately, the ocean. Urban runoff is a significant source of water pollution, causing possible declines in fisheries, restrictions on swimming, and limiting our ability to enjoy many of the other benefits that water resources provide (USEPA, 1992). Urban runoff in this context includes all flows discharged from urban and suburban land uses into stormwater conveyance systems and receiving waters and includes both dry weather non-stormwater sources (e.g., runoff from landscape irrigation) and wet weather stormwater runoff. In this handbook, urban runoff and stormwater runoff are used interchangeably.

Historically, the effort to control the discharge of stormwater focused on rate (e.g., drainage, flood control) and, to a limited extent, on quality of the stormwater (e.g., sediment and erosion control). However, since the 1980s awareness of the need to improve water quality has increased. With this awareness, federal, state and local programs have been established to pursue the ultimate goal of reducing pollutants contained in stormwater discharges to our waterways. The emphasis of these programs is to promote the concept and the practice of preventing pollution at the source, before it can cause environmental problems (USEPA, 1992).

Construction can cause both temporary and permanent impacts on water quality. Temporary construction activities can result in the release of construction materials and increased sediment discharge from ground disturbing activities. The finished project may result in modification of the site's response to precipitation. New development and redevelopment projects can result in permanent post-construction water quality impacts because more precipitation runs off the site and less precipitation is intercepted, evapotranspired, and infiltrated.

1.1 Handbook Purpose and Scope

The purpose of this handbook is to provide general guidance for selecting and implementing Best Management Practices (BMPs) that will eliminate or reduce the discharge of pollutants from construction sites, during the construction process, to waters of the state. This handbook also provides guidance on developing and implementing Stormwater Pollution Prevention Plans (SWPPPs) that document the selection and implementation of BMPs for a particular construction project.

This handbook provides the framework and serves as a resource for an informed selection of BMPs, and development and implementation of a site-specific SWPPP. However, complying with National Pollutant Discharge Elimination System (NPDES) Permit requirements and local ordinances rests with the land owner. An appropriately qualified stormwater professional must select BMPs that are appropriate for the site and that will provide effective control of construction site stormwater pollution.

BMPs that address the post-construction impacts of new and redevelopment activities are addressed in the *New Development and Redevelopment Best Management Practice Handbook* (CASQA, 2003).

The scope of this handbook is limited to traditional construction projects and does not detail the BMP or SWPPP requirements for Linear Underground/Overhead Projects (LUPs).

1.1.1 Users of the Handbook

This handbook provides guidance suitable for use by a wide range of individuals involved in construction site water pollution control. Each user of the handbook is responsible for working within their capabilities obtained through training and experience, and for seeking the advice and consultation of appropriate experts.

The target audience for this handbook includes: developers, including their planners and engineers; contractors, including their engineers, estimators, superintendents, foremen, tradesmen, and subcontractors; municipal agencies, including their engineers, municipal inspectors, building inspectors, permit counter staff, code enforcement officers, and construction staff; regulatory agencies, including permit staff and enforcement staff; and the general public with an interest in stormwater pollution control.

1.1.2 Organization of the Handbook

The handbook is organized to assist the user in selecting BMPs and developing and implementing SWPPPs for construction sites. The handbook consists of the following sections:

California Stormwater BMP Handbook - Construction

Section 1
Introduction
General review of the sources and impacts of construction activity stormwater discharges and provides an overview of the federal, state, and local programs regulating stormwater discharges.

Section 2
Stormwater Pollution Prevention Planning for Construction
Description of how to prepare and implement a SWPPP for a construction project; including minimum requirements, construction activity assessment, BMP selection, and stormwater control planning.

Section 3
Erosion and Sediment Control BMPs
Overview of BMPs for erosion, sediment, wind, and tracking control.

Section 4
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Overview of BMPs for non-stormwater management and materials management including waste materials and material stockpiles.

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Glossary and List of Acronyms
Terms and abbreviations used in the handbook.

Appendix A
General Permit
Construction General Permit applicable to most construction activities in the state.

Appendix B
SWPPP Outline
Annotated SWPPP outline containing the elements required by the General Permit.

Appendix C
Rain Event Action Plan Templates
Example of a REAP modifiable for each phase of construction.

Appendix D
Field Monitoring and Analysis Guide
Guidance on monitoring including field pH and turbidity measurements.

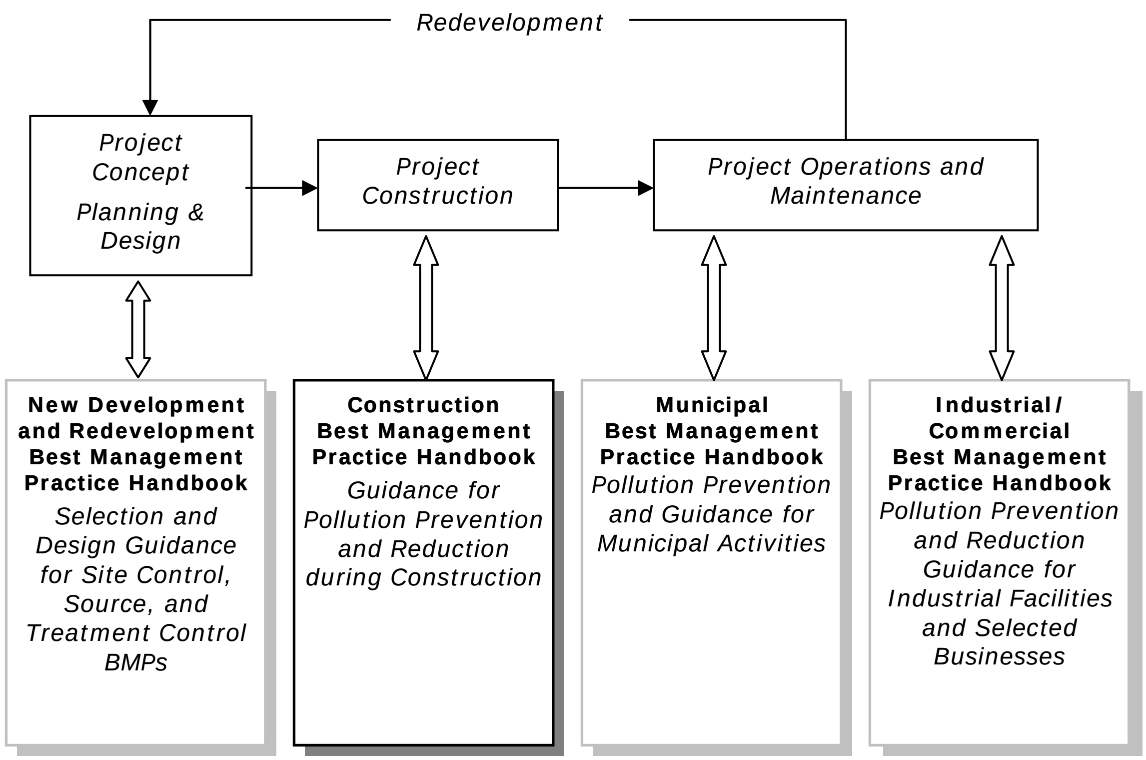
Appendix E
Bioassessment Resources
Resources for benthic macroinvertebrate bioassessments.

Appendix F
Temporary and Permanent Stabilization
Guidance on the selection of temporary stabilization techniques.

1.1.3 Relationship to other Handbooks

This handbook is one of four handbooks that have been developed by the California Stormwater Quality Association (CASQA) to address BMP selection. Collectively, the four handbooks address BMP selection throughout the life of a project – from planning and design – through construction – and into operation and maintenance. Individually, each handbook is geared to a specific target audience during one stage of the life of a project. This handbook, the *Construction Handbook*, addresses selection and implementation of BMPs and the development of SWPPPs for the construction phase.

Project Lifecycle



For a comprehensive understanding of stormwater pollution control throughout the lifecycle of the project, it is recommended that the reader obtain and become familiar with all four handbooks. Typically, municipal stormwater program managers, regulators, environmental organizations, and stormwater quality professionals will have an interest in all four handbooks. For a focused understanding of stormwater pollution control during a single phase of the project lifecycle, a reader may obtain and become familiar with the handbook associated with the appropriate phase. Typically, contractors, construction inspectors, industrial site operators, commercial site operators, some regulators and some municipal staff may have an interest in a single handbook.

1.1.4 Significant Changes to 2009 Construction Handbook

The *Stormwater Best Management Practice Handbooks* were originally published in 1993, and subsequently updated in 2003. This 2009 update of the *Construction Handbook* reflects the current state of construction stormwater quality management practices and revised regulatory requirements. An interactive web portal as a platform for the handbooks has also been created http://www.casqa.org.

Overall the information in the *Construction Handbook* has been updated and reorganized. Hyperlinks have been provided throughout the handbook and in the References and Resources section to direct users to additional information. Significant changes in the 2009 update are noted in Table 1-1.

Table 1-1 Significant Changes in the 2009 Construction Handbook

	Change Summary	Handbook
Section 1	Updated and new information on changes in post construction runoff	1.2.3 and 1.3.2
	Consolidation of information on vector production	1.2.5
	New information on numeric action levels and numeric effluent limitations	1.3.2
	Updated and expanded references and resources	1.4
Section 2	New information on the application of the low rainfall erosivity waiver	2.2.1
	New information on construction site risk determination	2.2.2
	New information on bioassessment monitoring requirements	2.2.5
	Updated information on the preparation of SWPPPs	2.4
	New information on Rain Event Action Plans	2.5.1
	Updated information on training	2.5.4
	Updated and new information on construction site monitoring	2.5.5
Section 3	Updates to 13 Factsheets (EC-3, EC4, EC-5, EC-6, EC-7, SE-1, SE-2, SE-4, SE-5, SE-6, SE-8, SE-10, and WE-1)	3.6
	Deletion of one Factsheet (EC-13)	3.6
	Addition of seven new Factsheets (EC-14, EC-15, EC-16, SE-12, SE-11, SE-13, and SE-14)	3.6
Section 4	Updates to 11 Factsheets (NS-2, NS-3, NS-12, NS-13, NS-16, WM-1, WM-2, WM-3, WM-8, and WM-9)	4.4
Appendices	Appendix A – 2009 Construction General Permit	A-1
	Appendix B – New annotated SWPPP outline to replace the template	B-1
	Appendix C – New REAP template	C-2
	Appendix D – New field monitoring and analysis guidance	D-1
	Appendix E – New information on bioassessment summary and resources	E-1
	Appendix F – New guidance on selecting temporary slope stabilization techniques	F-1

1.2 Construction Sites and their Impacts on Water Quality

1.2.1 Pollutants Associated with Construction Activities

Stormwater runoff contains numerous natural constituents. However, activities such as construction, if not adequately managed, can increase constituent concentrations to levels that may impact water quality. Pollutants associated with stormwater include sediment, nutrients, bacteria and viruses, oil and grease, metals, organics, pesticides, gross pollutants (floatables), and miscellaneous waste. Some constituents can also affect the pH of stormwater. Stormwater pollutants and their impact on water quality are described in Table 1-2.

Excessive erosion and sedimentation during construction are perhaps the most visible water quality impacts due to construction activities. Other less visible impacts are associated with off-site discharge of pollutants such as metals, nutrients, soil additives, pesticides, construction chemicals, and other construction waste. After the construction project is complete, the changes to the landscape due to the project may alter the existing runoff regime or introduce new sources of pollutants that continue to impact water quality into the future. The magnitude of stormwater impacts depends on construction activities, climatic conditions, and site conditions. Development of a comprehensive SWPPP requires a basic understanding of the impacts, pollutant sources and other contributing factors, as well as BMPs to eliminate or reduce these impacts.

1.2.2 Erosion and Sedimentation

Soil erosion is the process by which soil particles are removed from the land surface by wind, water, or gravity. Most natural erosion occurs at slow rates; however, the rate of erosion increases when land is cleared or altered and left unprotected. Construction sites, if unprotected, can erode at rates in excess of one hundred times the natural background rate of erosion.

Sediment resulting from excessive erosion is a pollutant. Sedimentation is defined as the settling out of particles transported by water. Sedimentation occurs when the velocity of water carrying suspended soil particles is slowed sufficiently and the suspended soil particles settle out. Larger particles, such as gravel and sand, settle more rapidly than fine particles such as silt and clay. Effective sediment control begins with proper erosion control, which minimizes the availability of particles for settling downstream.

Erosion from Rainfall Impact

The impact of raindrops on bare soil detaches soil particles and can cause erosion. On undisturbed soil protected by vegetation or other cover, the rain impact erosion is minimal. Construction activities increase the amount of exposed and disturbed soil, which increases erosion potential from rainfall.

Table 1-2 Pollutant Impacts on Water Quality

Sediment	Sediment is a common component of stormwater, and can be a pollutant. Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can transport other pollutants that are attached to it including nutrients, trace metals, and hydrocarbons. Sediment is the primary component of turbidity, total suspended solids (TSS), and Suspended Sediment Concentration (SSC).
Nutrients	Nutrients including nitrogen and phosphorus are the major plant nutrients used for fertilizing landscapes, and are often found in stormwater. These nutrients can result in excessive or accelerated growth of vegetation and algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the nitrogen forms) can be toxic to fish.
Bacteria and viruses	Bacteria and viruses are common contaminants of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming.
Oil and Grease	Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants and waste oil disposal.
Metals	Metals including lead, zinc, cadmium, copper, chromium, and nickel are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because some are toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies.
Synthetic Organics	Synthetic organics may be found in stormwater in low concentrations. Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed. In addition, deliberate dumping of these chemicals into storm drains and inlets causes environmental harm to waterways.
Pesticides	Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been detected repeatedly in stormwater at levels toxic to certain organisms, even when pesticides have been applied in accordance with label instructions. Stormwater can transport pesticides from target areas into receiving waters where, under certain conditions, they may impact non-target animals such as invertebrates and fish.
Gross Pollutants	Gross pollutants (trash, debris, and floatables) typically resulting from an urban environment, industrial sites, and construction sites may create an aesthetic "eye sore" in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes, and estuaries sometimes causing fish kills.
Vector Production	Vectors are defined as any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including mosquitoes, flies, ticks, mites, and rats. Mosquitoes are the most common vectors associated with stormwater and those of greatest concern because they can transmit diseases to humans and animals, as well as cause extreme biting nuisance. Mosquitoes require water that stands longer than 96 hours to complete their development, which can occur in less than one week.

Sheet Erosion (Inter-rill Erosion)

After rainfall strikes the ground, it flows in a thin layer for a short distance. The distance of sheet flow depends on slope, soil roughness, type of vegetative cover, and rainfall intensity. Sheet erosion, also called inter-rill erosion, due to sheet flow on undisturbed soils is minimal and greater on soils disturbed by construction. However, sheet flows are capable of transporting soil particles dislodged by the impact of raindrops onto bare soil, and thus cannot be ignored.

Rill and Gully Erosion

As runoff accumulates, it concentrates in rivulets that cut grooves (rills) into the soil surface. Rills generally run parallel to one another and to the slope of the soil surface. If rills are left unchecked, several rills may join together to form a gully. While there is no precise definition of when a rill becomes a gully, in general rills are small enough to be stepped across and can be easily repaired, whereas a gully requires added effort to be traversed and typically will require heavy equipment to repair. The rate of rill erosion can easily be one hundred times greater than that of sheet flow erosion, and the rate of gully erosion can easily be one hundred times greater than rill erosion. Due to the significant amount of sediment generated by rill and gully erosion, these types of erosion must be given top priority for elimination, reduction, and control. Rills and gullies form sooner on exposed soils than on vegetated soils.

Stream and Channel Erosion

In general, one or more of the following activities that may occur during construction can change the hydrology of the area and may increase erosion of the bed and banks of natural drainage channels:

- Clearing and compacting the soil and recontouring the site during construction may increase the volume and rate of runoff leaving the site.
- Replacing pervious natural ground with impervious cover such as buildings and pavement further increases runoff volume and rate.
- Using detention basins to capture sediment extends the duration of flows leaving the site.

Wind Erosion

Dust is defined as solid particles or particulate matter that are predominately large enough to eventually settle out from the air but small enough to remain temporarily suspended in the air for an extended period of time. Dust from a construction site originates from rock and soil surfaces, material storage piles and construction materials. Dust is generated by earthwork, demolition, traffic on unpaved surfaces, and strong winds. See Table 1-3.

Table 1-3 Examples of Dust Sources at Construction Sites

Vehicle and Equipment Use	Exposed Areas	Construction Activities
■ Vehicle and equipment entering and leaving the project site ■ Vehicle and equipment movement and use within the project site ■ Sediment tracking off-site ■ Temporary parking lots and staging areas ■ On-site construction traffic	■ Areas of exposed soil that have been cleared and grubbed ■ Areas of exposed soil that have been excavated, filled, compacted, or graded ■ Construction staging areas ■ Vehicle and equipment storage and service areas ■ Material processing areas and transfer points ■ Construction roads ■ Spilled materials ■ Construction stockpiles ■ Soil and debris piles	■ Land clearing and grubbing ■ Earthwork including soil excavation, filling, soil compaction, rough grading, and final grading ■ Drilling and blasting ■ Materials handling, including material stockpiling, transfer, and processing ■ Batch dropping, dumping ■ Conveyor transfer and stacking ■ Crushing, milling and screening operations ■ Demolition and debris disposal ■ Tilling ■ Underground utility operations

1.2.3 Changes in Post-Construction Runoff

Under past practices, post-construction activities have resulted in modified natural watershed and stream processes. The stream and channel erosion impacts that can occur during construction can continue after construction has been completed. Increases in runoff peak flow, volume, and duration from a development project and resulting erosion impacts are caused by altering the terrain; modifying the vegetation and soil characteristics; introducing impervious surfaces such as pavement and buildings; increasing drainage density and connectivity through pipes and channels; and altering the condition of tributary stream channels through straightening, deepening, and armoring. These changes result in a drainage system where sediment transport capacity is increased and sediment supply is decreased, creating an unstable hydrologic and geomorphic condition. A receiving channel's response is dependent on dominant channel materials and its stage of adjustment to these changing conditions.

Control of erosion in streams and channels downstream of the construction site as a result of construction activities is a complex issue and is usually best addressed by local agencies through hydromodification management plans or comprehensive drainage master plans that address the effects of runoff from small, frequent storm events. Where these plans are available, the local agency may specify specific BMP requirements applicable to construction projects, which in turn must be incorporated into the SWPPP. In some situations, local agencies may require developers of large projects to conduct a study of the specific impacts related to development of the project. Where these plans are not available, the SWPPP must include an effective stormwater management strategy to reduce runoff volumes and pollutants from the completed project.

1.2.4 Other Pollutants

Erosion and sedimentation discharges are perhaps the most visible and significant source of pollutants associated with construction sites. However pollutants, such as nutrients, bacteria, viruses, oil, grease, metals, organics, pesticides, and gross pollutants must always be considered as they can be associated with both acute and chronic problems in receiving waters. Table 1-4 presents a matrix that identifies the most common source of other pollutants at construction sites.

Table 1-4 Other Pollutants

Construction Activity	Pollutants						
	Sediment	Nutrients	Trace Metals	Pesticides	Oil, Grease, Fuels	Other Toxic Chemicals	Miscellaneous Waste
Construction Practices							
Dewatering Operations	X	X	X	X	X	X	
Paving Operations	X				X	X	X
Structure Construction/Painting			X		X	X	X
Material Management							
Material Delivery and Storage	X	X	X	X	X	X	
Material Use		X	X	X	X	X	
Waste Management							
Solid Waste	X	X					X
Hazardous Waste						X	
Contaminated Spills	X	X	X	X	X	X	X
Concrete Waste						X	X
Sanitary/Septic Waste							X
Vehicle/Equipment Management							
Vehicle/Equipment Fueling					X	X	X
Vehicle/Equipment Maintenance					X	X	X

1.2.5 Vector Production

The potential for vector production must always be considered during construction activities because vectors can create a human health hazard and nuisance, both on site and in the surrounding area. The California Health and Safety Code broadly defines vectors as "any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rats, but not including any domesticated animal." Several types of vectors may become associated with construction sites, including flies and rats, but mosquitoes are the most common and those of greatest concern because they can transmit diseases to humans and animals, as well as cause extreme biting nuisance. Any water that stands for greater than 96 hours can become a source of mosquitoes since many species can complete their development in less than one week. For this reason, complete dewatering of stormwater treatment structures as well as other open water-holding devices or containers should be prioritized within this time-frame. Any objects that provide shelter within standing water (e.g. floating or emergent vegetation, riprap, accumulations of floating trash) can make the habitat more attractive to mosquitoes. Mosquito production potential varies by site, season, rainfall, and water quality, and control measures may be required in areas where water cannot be removed in less than 96 hours. Responsible mosquito control uses an integrated approach that is best conducted in coordination with local agencies with expertise in this field (e.g., Mosquito Abatement Districts). Contact information for local mosquito and vector control agencies can be found through the California Department of Public Health website by entering the zip code of the location of interest under "Locate Your Local Mosquito and Vector Control Agency" at http://westnile.ca.gov.

1.2.6 Impacts of Erosion and Sedimentation, Runoff Changes, and Other Pollutants

The impacts due to erosion and sedimentation, runoff changes, and other pollutants can be placed in three categories:

- Degradation of aquatic and riparian ecosystems;
- Pollutant transport; and
- Erosion of land and sedimentation within waterways and public facilities (e.g., storm drains).

Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. In addition, sediment particles can transport other pollutants that are attached to them including nutrients, trace metals, and hydrocarbons. Sediment particles such as silts and clays are the primary components of turbidity, total suspended solids (TSS), and Suspended Sediment Concentration (SSC) water quality analytical parameters.

In addition to impacts directly associated with sedimentation, various pollutants can be transported along with sediment particles leaving construction sites. Such pollutants include metals, nutrients, conventional pollutants, pesticides, and bacteria. These pollutants often originate from organic components, plant residues, and nutrient elements within soils on the construction site, and are thus mobilized by erosion and later deposited downstream during sedimentation. Alternatively, these other pollutants may be generated independent of erosion and because of their nature can have significant detrimental affects to receiving waters.

Construction activity may cause increased erosion and sedimentation within waterways and public facilities. Some construction activity will increase impervious area and/or change drainage patterns, resulting in increased runoff volumes, rates, and durations, which have the potential to erode downstream watercourses. Other construction activities such as grading may increase erosion from the construction site by disturbing and exposing the soil. The eroded soil particles from the construction site may flow downstream and fill drainage systems, reservoirs, and harbors.

In order to control the impacts of erosion, sedimentation, runoff changes, and other pollutants on receiving waters, construction sites need to implement BMPs to eliminate or reduce the discharge of pollutants in stormwater allowed non-stormwater discharges from the construction site.

1.3 Regulatory Programs

The need to protect our environment has resulted in a number of laws and subsequent regulations and programs. In the following sections, various federal, state, and local programs are discussed in relationship to the control of pollutants in stormwater. The programs are expected to change and evolve over the next several years and the user is advised to contact state and local officials for further information.

1.3.1 Federal NPDES Program

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act [CWA]) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with an NPDES permit. The 1987 amendments to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial stormwater discharges, including discharges associated with construction activities, under the NPDES Program.

On November 16, 1990, the U.S. Environmental Protection Agency (EPA) published final regulations that established stormwater permit application requirements. The regulations, also known as Phase I of the NPDES stormwater program, provide that discharges of stormwater to waters of the Unites States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge complies with an NPDES Permit.

Phase II of the NPDES stormwater program expands the requirements by requiring operators of small small construction sites with a soil disturbance equal to or greater than one and less than five acres of land or part of a larger common plan of development that disturbs more than one acre.

In 2008, EPA published draft Effluent Limitation Guidelines (ELGs) for the construction and development industry with the promulgation of the ELGs scheduled for December 2009. State NPDES authorities must incorporate the ELGs when they next revise their construction NPDES permits. In California this is anticipated to occur during the next permit renewal cycle in 2014 or if the State Water Resource Control Board (SWRCB) opts to reopen the permit when EPA promulgates the ELGs.

1.3.2 State Construction NPDES Program

In California, the NPDES stormwater permitting program is administered by the SWRCB through its nine Regional Water Quality Control Boards (RWQCBs). The SWRCB has established a NPDES general permit that can be applied to most construction activities in the state. Construction permittees may choose to obtain individual NPDES permits instead of obtaining coverage under the construction general permit, but this can be an expensive and complicated process, and its use should generally be limited to very large construction projects that discharge to critical receiving waters. Because individual permits are rare and would likely follow the general permit to a large extent, this handbook is structured around the general permit.

In California, owners of construction projects may obtain NPDES permit coverage by filing Permit Registration Documents (PRDs) to be covered under the *State Water Resources Control Board Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities* (General Permit) *(SWRCB, 2009)*.

The General Permit was adopted on September 2, 2009. The permit becomes effective on July 1, 2010. Until July 1, 2010, new and existing construction projects apply for and remain subject to the conditions of Order 99-08-DWQ (SWRCB, 1999). A summary of significant changes to the General Permit can be found in the Section F of the General Permit's Fact Sheet, which is included in Appendix A of this handbook.

Once effective, the General Permit establishes a risk-based approach to stormwater control requirements for construction projects. The General Permit identifies three project risk levels, and a set of conditions by which permit coverage can be waived. Permit requirements (e.g., minimum BMPs, monitoring requirements, reporting requirements, and compliance assessment criteria) are tied to the project risk level. Projects with higher risk levels have more requirements than lower risk level projects. The lowest risk project may qualify for a permit waiver.

The primary objectives of the General Permit are to:

- Reduce erosion;
- Minimize or eliminate sediment in stormwater discharges;
- Prevent materials used at a construction site from contacting stormwater;
- Implement a sampling and analysis program;
- Eliminate unauthorized non-stormwater discharges from the construction sites;
- Implement appropriate measures to reduce potential impacts on waterways both during and after construction of projects; and
- Establish maintenance commitments on post-construction pollution control measures.

Failure to comply with the General Permit may result in significant fines for each violation and possible imprisonment.

Who must comply with the Construction General Permit?

- The General Permit applies to stormwater discharges associated with construction activity that:
  - disturbs one acre or more of soil; or
  - disturbs less than on acre but is part of a larger common plan of development or sale of one or more acres; or
  - is required to obtain permit coverage by the RWQCB.
- The owner of the land is responsible for compliance.

Who does not need to seek coverage under the Construction General Permit?

- Projects that are: conducted on Tribal Lands; conducted in the Lake Tahoe Hydrologic Unit; or covered by an individual NPDES permit for stormwater discharges, do not require coverage under the General Permit. Landfill construction activities that are subject to the Industrial General Permit do not require coverage under the Construction General Permit.
- Activities to maintain the original line, grade, and hydraulic function of a facility do not require coverage under the General Permit. However, pollution control during these activities may still be required under other state and local regulations and ordinances.
- Construction activities meeting all three of the following criteria do not require coverage under the General Permit; (1) result in soil disturbances of less than one acre, (2) are not part of a larger common plan of development that disturbs one or more acres of soil, and (3) do not constitute a threat to water quality.
- Small construction projects (1-5 acres) that qualify for the rainfall erosivity waiver, do not need to obtain coverage under the General Permit, but must file the necessary certifications with the SWRCB.

How to comply with Construction General Permit

- Submit the PRDs, including a Notice of Intent (NOI), into the Stormwater Multi-Application and Reporting System (SMARTS), and pay fees 14 days prior to the beginning of construction. A copy of the General Permit and the NOI can be found at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml. The General Permit is included in Appendix A of this handbook.
  - Standard PRDs include:
    - NOI
    - Construction Site Risk Calculation (Construction Site Sediment and Receiving Water Risk Determination)
    - Site Map
    - SWPPP
    - Annual Fee

- o Additional documents may be required depending on the construction type and location:
  - Post-construction water balance calculation
  - Active Treatment System (ATS) plan
- Employ a Qualified SWPPP Developer (QSD) to prepare the SWPPP. The contents of the SWPPP are discussed in Section 2 and Appendix B of this handbook.
- Obtain a Waste Discharger Identification (WDID) number from the SWRCB before beginning construction. This number will be issued once your PRDs are administratively accepted and fee is received.
- Keep the SWPPP, REAPs, monitoring data on the construction site.
- Employ a Qualified SWPPP Practitioner (QSP) to implement the SWPPP during construction and develop REAPs.
- Install, inspect, and maintain BMPs required by the General Permit.
- Implement the SWPPP.
- Conduct monitoring, as required, and assess compliance with the Numeric Action Levels (NALs) or Numeric Effluent Limitations (NELs) appropriate to your project.
- Report monitoring data.
- Have a QSD revise the SWPPP as needed to reflect the phases of construction.
- Submit Notice of Termination (NOT) into the SMARTS when construction is complete and conditions of termination listed in the NOT have been satisfied. A copy of the NOT can be found at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

1.3.2.1 Numeric Action Levels and Numeric Effluent Limitations in the General Permit

Runoff discharges from construction sites may become contaminated with sediment and alkaline materials as a result of the construction activities. The General Permit requires effluent monitoring and sets action levels and effluent limitations to assess BMP performance and determine permit compliance.

Numeric Action Levels

The purpose of the NAL is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters. The NALs for pH and turbidity are not directly enforceable and do not constitute effluent limitations.

Project sites that are determined through the Construction Site Risk Calculation to be Risk Level 2 or Risk Level 3 are subject to the following NALs:

- pH 6.5 to 8.5 (during construction phases when there is a high risk of high pH discharge); and

- turbidity 250 Nephelometric Turbidity Units (NTU).

Numeric Effluent Limitations

The purpose of the NELs is to assess compliance with the General Permit. Exceeding a NEL is considered a permit violation and is directly enforceable.

Project sites that are determined to be Risk Level 3 are subject to the following NELs:

- pH 6.0 to 9.0 (during construction phases when there is a high risk of high pH discharge); and
- turbidity 500 NTU.

NELs are exempted in two circumstances:

(1) during compliance storm events reaching the 5-year, 24-hour storm event (expressed in tenths of an inch of rainfall) as determined by using these maps:

- Northern California: http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
- Southern California; http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

(2) if run-on is caused by a forest fire or any other natural disaster.

1.3.2.2 Runoff Reduction Requirements in the General Permit

Development projects that are constructed in urban areas covered by Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permits and Stormwater Management Plans (SWMPs) are subject to the post-construction requirements for stormwater treatment and flow control in those permits or SWMPs. For projects constructed in other areas of the state not subject to an approved MS4 SWMPs, the General Permit contains post-construction runoff reduction standards that must be met.

The General Permit's post-construction stormwater performance standard aims to match post-construction runoff volume to pre-construction runoff volume for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). This approach not only reduces the risk of impact to the receiving water's channel morphology but also provides some protection for water quality. To assist dischargers with selection of appropriate control measures to achieve this goal the General Permit provides a water balance calculator and worksheets, which is available at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

1.3.3 Municipal NPDES Programs

The Phase I municipal stormwater program and municipal NPDES stormwater permits cover and regulate municipalities with populations of over 100,000, drainage systems interconnected with these municipalities' systems, or municipalities determined to be significant contributors of pollutants. In California, the major urbanized counties are covered by NPDES municipal stormwater permits.

Municipalities with NPDES stormwater permits for their own MS4s are responsible for developing a management program for public and private construction activities in their jurisdiction. Each program addresses appropriate planning and construction procedures;

provides for the inspection and monitoring of construction sites that discharge stormwater into their systems; and provides for education and training for construction site operators.

Phase II of the municipal stormwater program regulates municipalities with populations that as of March 2003 were less than 100,000, including urbanized areas (areas with a population of 50,000 and density greater than 1,000 people per square mile), cities, and county areas designated by the state based on site-specific criteria, and various state and federal facilities. Each designated entity must submit a municipal NOI along with a copy of its Stormwater Management Plan (SWMP). The Phase II SWMP must address six minimum control measures, including the following measures related to construction activities:

- Illicit Discharge Detection and Elimination - Developing and implementing a plan to detect and eliminate illicit discharges to the storm drain system including illicit connections and illegal dumping.
- Construction Site Stormwater Runoff Control - Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land.
- Post Construction Stormwater Management in New Development and Redevelopment - Developing, implementing, and enforcing a program to address discharges of stormwater runoff from new development and redevelopment areas.

While Phase I and Phase II programs for construction sites vary throughout the state, the programs have many similarities, including the requirement for construction sites to obtain coverage under the General Permit. For specific information on local program requirements construction sites owners must contact the municipal stormwater program coordinator in the jurisdiction where the project will be constructed. Local programs may have SWPPP format, content, and submittal requirements that may differ from the General Permit.

1.4 References and Resources

The following references and resources include both specific documents or information sources referenced or cited throughout the *Construction Handbook* and information sources that handbook users may find useful. The BMP factsheets in Section 3 and Section 4 of this handbook contain their own references and citations.

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Section 2
Stormwater Pollution Prevention Plan

2.1 Introduction

This section primarily describes the preparation and implementation of a SWPPP for a construction project. A construction site subject to the General Permit must prepare and implement a SWPPP that meets the requirements of the General Permit.

For projects subject to the General Permit, a SWPPP must be prepared before construction begins, ideally during the project planning and design phases. This is because much of the information required by the SWPPP is already part of the project design documentation. Or more importantly, because the design may need to be modified to incorporate or accommodate the construction and post-construction phase controls. Optimally, the SWPPP should be completed at the end of the design phase but it must be completed to submit with the PRDs.

Construction projects with a disturbed area of less than one acre are not covered under the General Permit at this time and therefore are not required by the SWRCB to develop a SWPPP. However, the local municipality or RWQCB may require the development of a SWPPP or a Stormwater Pollution Control Plan for any projects that require a grading permit or if it is determined that the project poses a water quality risk threat. When preparing a SWPPP to meet local requirements, contact the local authorities to determine local requirements.

Implementation of the SWPPP begins when construction begins, before the initial clearing, grubbing, and grading operations, since these activities can usually increase erosion potential on the site. During construction, the SWPPP should be referred to frequently, and amended by the QSD as changes, which could have significant effects on the potential for discharge of pollutants, occur in construction operations.

This section is organized to describe the initial site assessment phase, the principles used to select BMPs, and the preparation and implementation of the SWPPP.

2.2 Assess Construction Site and Planned Activities

The assessment of the construction site and planned activities provides the information upon which BMPs are selected and is the source of much of the information needed for the SWPPP (see Appendix B of this handbook for an annotated SWPPP outline).

It is at the assessment phase that a project can determine whether it will qualify for a rainfall erosivity waiver and determine the project risk level. These two initial assessments determine the project's requirements, such required minimum BMPs, monitoring requirements, and corresponding project compliance documentation, such as the SWPPP. Site assessment information to be collected includes site history, disturbed areas and erosion potential, and contractor activities.

2.2.1 Rainfall Erosivity Wavier

Small construction projects (1-5 acres) that qualify for the General Permit's rainfall erosivity waiver, do not need to prepare a SWPPP, but must file the necessary certifications with the SWRCB. Projects conducted during periods of low rainfall erosivity have significantly lower risk of impacting water quality.

EPA maintains a low erosivity calculator at: http://cfpub.epa.gov/npdes/stormwater/LEW/site_name_proj_date.cfm. To use the calculator, you will need the start and end date of the project and the project location (either the latitude and longitude or street address).

Owners of small projects should carefully assess the planned construction period to determine whether a rainfall erosivity waiver will be applicable. Small changes to the planned construction period may affect whether or not a project will need permit coverage and a SWPPP. It is anticipated that many projects that can be completed in a single summer season in California will qualify for a low rainfall erosivity waiver.

2.2.2 Construction Site Risk Determination

During construction activities, projects of all sizes pose different risks to water quality. These risks are dependent on a project's location, timeline, and site characteristics. This section describes the steps involved with determining the risk level for a traditional construction project.

Construction site risk determinations are the key part of establishing the minimum permit requirements for a construction project. A project's risk level governs the applicable minimum BMPs, monitoring requirements, reporting requirements, and the effluent standards used to assess monitoring data and the project compliance.

There are two major steps to determining risk for traditional construction projects:

- Sediment Risk – the relative amount of sediment that can be discharged, given the project and location details; and
- Receiving Water Risk – the risk sediment discharges pose to the receiving waters.

2.2.2.1 Sediment Risk Factor

Sediment risk is determined by multiplying the R-, K-, and LS-factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss (through sheet and rill erosion) expressed in tons/acre.

A = (R)(K)(LS)(C)(P)

Where:
A = estimated soil loss in tons/acre

R = rainfall-runoff erosivity factor (using EPA's online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm).

K = soil erodibility factor found through either:
Option (1) the Geographical Information System (GIS) map provided in the General Permit, or
Option (2) the discharger may conduct a site specific soil particle analysis (using test method

ASTM-D-422) and determine the K-factor from the triangular nomograph provided in the General Permit (see also Goldman, 1986).

LS = length-slope factor found through either:
Option (1) the GIS map provided in the General Permit, or
Option (2) the discharger may conduct a site specific evaluation to determine the site LS factor. The LS-factor must be determined as the pre-construction condition of the site. Because sites typically have multiple grades and slope lengths, dischargers need to calculate an area-weighted LS factor for the entire site for use in the Risk Determination Worksheet.

C = cover factor (erosion controls – assumed in this application to be 1.0 to simulate bare ground controls).

P = management operations and support practices (sediment controls – assumed in this application to be 1.0 to simulate bare ground controls).

"**A**" values of less than 15 tons/acre is considered **LOW** sediment risk, between 15 and 75 tons/acre is considered **MEDIUM** sediment risk, and over 75 tons/acre is considered **HIGH** sediment risk.

If Option 1 is used to determine the K-factor (GIS Map), Option 1 must also be selected to determine the LS-factor. Likewise, if Option 2 is used to determine the K-factor (site specific calculation), Option 2 must also be used to determine the LS-factor. Scale issues prohibit interchanging the two methods.

Some project features may be adjusted to decrease a project's sediment risk. These features include:

- Project duration – The length of time a project site is exposed to the environment will increase the potential for sediment discharges. The project duration will affect the R-factor. Shorter projects will have lower R-factors.
- Season – Construction scheduled during the rainy season will increase the potential for sediment discharges. The construction schedule will affect the R-factor. Projects conducted during the dry season will have lower R-factors.
- Project site location – The soil types and slopes associated with a site location can increase or decrease the potential for sediment discharges. Soil type affects the K-factor and the slopes affect the LS-factor. Projects conducted on sites with less erodible soils will have lower K-factors and projects conducted on flatter terrain with short sheet flow lengths will have lower LS-factors.

2.2.2.2 Receiving Water Risk Factor

Receiving water risk is based on whether a project drains to a sediment-sensitive water body. A sediment-sensitive water body is either:

- On the most recent EPA approved 303(d) list for water bodies impaired with sediment/siltation or turbidity or has a EPA-approved Total Maximum Daily Load (TMDL) implementation plan for sediment/siltation or turbidity (see http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_approved.shtml); or

- Has the existing beneficial uses of COLD **and** SPWN **and** MIGR.

If either of these two conditions is met, the receiving water risk is **High**; otherwise the receiving water risk is **Low**.

Beneficial use listings for water bodies may be found through the GIS map provided in the General Permit; or in the current Water Quality Control Plans (aka Basin Plans) developed by each RWQCB. Basin Plans are accessible through the website for each RWQCB: http://www.waterboards.ca.gov/waterboards_map.shtml. Two additional sources that list water body beneficial uses have been developed by the University of California, Davis, Information Center for the Environment:

- http://www.ice.ucdavis.edu/geowbs; and
- http://endeavor.des.ucdavis.edu/wqsid/bu.asp.

2.2.2.3 Project Risk Level

The sediment risk and receiving water risk are combined to determine a construction site's project risk level. Table 2-1 illustrates the matrix of possible project risk levels derived from the sediment risk and receiving water risk.

Table 2-1 Traditional Project Risk Levels

Receiving Water Risk	Sediment Risk		
	Low	Medium	High
Low	Project Risk Level 1	Project Risk Level 2	Project Risk Level 2
High	Project Risk Level 2	Project Risk Level 2	Project Risk Level 3

2.2.3 Site History

Existing site characteristics such as vegetation, environmental features, and areas of historic contamination (natural and/or industrial or agricultural) should be recorded on the project layout. Soil laboratory analysis may be required should prior contamination be suspected. The selection and implementation of construction BMPs and monitoring requirements will be affected by what existing features need to be protected or mitigated during construction. Good sources of information on previously existing contamination and past land uses include, but are not limited to, the following:

- Initial Studies or Environmental Impact Reports (EIRs) prepared under the requirements of the California Environmental Quality Act (CEQA);
- Environmental Assessments or Environmental Impact Statements (EIS) prepared under the requirements of the National Environmental Policy Act (NEPA); and
- Phase I Assessments prepared for property transfers.

2.2.4 Disturbed Areas and Erosion Potential

The physical condition of the site and adjacent areas should be reviewed. A project layout showing what is being constructed, limits of construction, project schedule, and existing features should be developed. Site characteristics including drainage patterns, soils, vegetation, surface water bodies, and steep or unstable slopes should be noted. If available, the hydrology report, soils report, and a grading/drainage plan should be consulted. Physical conditions at the site will change as construction progresses. The SWPPP must be developed or amended to address conditions as activities change at the site.

The hydrology reports should assess information such as drainage areas and patterns, rainfall information and expected run-on and runoff volumes and flow rates, etc. A soils report will identify soil constraints, design criteria, and soil stability relative to the project design, and may also have soil type and particle size information. Both of these reports are used in the preparation of the preliminary grading and drainage plan. The grading and drainage plan should identify areas of cut and fill, slope during and after grading, protection of existing vegetation, and areas of soil disturbance. They also form the technical basis for selection of erosion and sediment control BMPs.

2.2.5 Bioassessment

The need for bioassessment monitoring must be considered during the assessment and planning phases because if required the first part of the bioassessment monitoring must be conducted before the start of construction activities.

Bioassessment consists of benthic macroinvertebrate sampling within the appropriate index period for the project location before commencement of construction activities, and after construction is completed. See Appendix E of this handbook for more information regarding bioassessment monitoring.

2.2.6 Contractor Activities

Information about contractor activities is required for the selection of proper BMPs. Details that should be recorded include:

- Equipment storage, cleaning, and maintenance areas and activities;
- Points of ingress and egress to the construction site;
- Material loading, unloading, and storage practices and areas, including construction materials, building materials, and waste materials; and
- Materials, equipment, and vehicles that may come in contact with stormwater.

2.3 Principles for Identifying and Selecting BMPs

The QSD selects BMPs. The contract between the owner and contractor should specify the responsibilities of the owner and contractor with regards to stormwater pollution control during construction. Owners must be aware that regardless of the contractual agreement between the owner and the QSD or the contractor with respect to BMP selection and SWPPP implementation, the owner is ultimately responsible for compliance with the General Permit.

Principles used to guide the selection of BMPs for construction activities are presented in the following sections. BMPs are generally selected in a three-step process:

- Define BMP objectives;
- Identify BMP category; and
- Select appropriate BMPs.

2.3.1 Define BMPs Objectives

Selection and implementation of BMPs is based on the pollution risks associated with the construction activity. Defining the pollution prevention goal is based on a review of information gathered during the assessment of the site and planned activities (Section 2.2). Once defined, BMP objectives are developed and BMPs selected. The BMP objectives for construction projects are as follows:

- Control Erosion and the Discharge of Sediment:
    - Control Site Perimeter: Delineate site perimeter to prevent disturbing areas outside the project limits. Divert upstream run-on safely around or through the construction project. Local codes usually state that such diversions must not cause downstream property damage or be diverted into another watershed. Runoff from the project site should be free of excessive sediment and other constituents. Control tracking at points of ingress to and egress from the project site.
    - Minimize Disturbed Areas: Phase clearing and grading to limit exposed area to that which can be protected; only clear land which will be actively under construction in the near term; minimize new land disturbance during the rainy season; and avoid clearing and disturbing sensitive areas (e.g., steep slopes and natural watercourses) and other areas where site improvements will not be constructed.
    - Stabilize Disturbed Areas: Provide temporary stabilization of disturbed soils for inactive portion(s) of the site. An inactive area is an area of the project that has been disturbed and is not scheduled to be re-disturbed for at least 14 days. Provide permanent stabilization during finish grade and landscape the site.
    - Protect Slopes and Channels: Safely convey runoff from the top of the slope and stabilize disturbed slopes as quickly as possible. Avoid disturbing natural channels. Stabilize temporary and permanent channel crossings as quickly as possible and ensure that increases in runoff velocity caused by the project do not erode the channel.

  - Retain Sediment: Retain sediment-laden waters from disturbed, active areas within the site.

- Manage Non-Stormwater Discharges and Materials:
  - Practice Good Housekeeping: Perform activities in a manner to keep potential pollutants from coming into contact with stormwater to eliminate or avoid exposure. When exposure cannot be avoided prevent contaminated stormwater from being transported off-site.
  - Contain Materials and Wastes: Store construction, building, and waste materials in designated areas that are protected from rainfall and contact with stormwater runoff. Dispose of construction waste in designated areas, and keep stormwater from flowing onto or off of these areas. Prevent spills and clean up spilled materials.

2.3.2 Identify BMP Categories

Once the BMP objectives are defined, identify the category of BMP best suited to meet each objective. The BMPs selected from each category depend on specific site conditions, construction activities, and cost considerations.

There are six BMP categories:

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

2.3.3 Select BMPs

BMPs for erosion and sediment control are listed in the EC, SE, WE, and TC categories. BMPs for contractor activities are listed in the NS, and WM categories. This is a general division of the BMP categories but there will some overlap especially as some contractor activities deal with erosion and sediment control BMPs.

2.3.3.1 BMPs for Erosion and Sediment Control

BMPs for erosion and sediment control are selected to meet the BMP objectives based on specific site conditions, construction activities, and cost. Various BMPs may be needed at different times during construction since activities are constantly changing.

Erosion control BMPs are a source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water, or wind. Sediment control BMPs are treatment control practices that trap soil particles after they have been detached and moved by rain, flowing water, or wind.

Selection of erosion control BMPs should be based on minimizing disturbed areas, stabilizing disturbed areas, and protecting slopes and channels. Selection of sediment control BMPs should be based on retaining sediment on site and controlling the site perimeter. Erosion and sediment control BMPs are listed in the EC, SE, WE, and TC categories, which are presented in Section 3.

2.3.3.2 BMPs for Contractor Activities

Certain contractor activities may cause pollution if not properly managed. BMPs should be selected based on the contractor activities information collected in the assessment of planned activities. The BMP objectives for contractor activities are practicing good housekeeping and containing materials and waste. BMPs for contractor activities are selected from the NS and WM categories, which are presented in Section 4. Several considerations for selecting a BMP for contractor activities include:

- Is it expected to rain? Selection of a BMP is different for the rainy season versus the dry season. Consider rescheduling activities for less rainy periods if possible.
- Will water be used and how much? The more water used and wastewater generated, the more likely that pollutants will be transported by this water. BMPs will be needed to contain or treat water that contacts potential pollutants to prevent them from being transported off-site.
- What are the site conditions? BMPs will differ depending on whether the activity is conducted on a slope or on flat ground and whether the activity is near a drainage structure or watercourse.
- What about accidents? Controls for common activities should be established, and preparations should be made to allow for quick response to accidents or spills including contingency plans for clean up and for sampling the contaminated stormwater.

2.4 Stormwater Pollution Prevention Plan

2.4.1 SWPPP Preparation

A QSD must prepare SWPPPs for projects covered by the General Permit. The SWPPP applies to all areas that are directly related to the construction activity, including but not limited to staging areas, storage yards, material borrow areas, access roads, etc. In most cases, the owner will enter into a contractual agreement with the QSD for preparation and with the QSP for the implementation of the SWPPP. However, owners must be aware that regardless of the contractual agreement between the owner and contractor with respect to BMP selections and SWPPP implementation, the owner is ultimately responsible for compliance with the General Permit. It is highly recommended that the owner and contractor jointly review the SWPPP with the QSD and QSP during its development and/or during a pre-construction conference.

The SWPPP is a document that addresses water pollution control during construction. The SWPPP must be prepared, submitted electronically, and available on the project site before the project owner, developer, or contractor begins any activity with the potential to cause water pollution. The SWPPP must be implemented year-round throughout the duration of the construction project and it must be available on site at all times.

The SWPPP should be directed at personnel on the construction project (e.g., QSP, supervisor, foreman, and inspectors). The SWPPP should provide specific guidance on actions to be taken by these personnel and should be presented in a format that accommodates day-to-day use (e.g., 3-ring binder, pullout sections, and checklists).

The SWPPP should provide a simple narrative and diagram that locates the construction site, identifies potential pollutant sources on site, and shows the location of the BMPs to be used to minimize erosion and sedimentation during construction. It should also describe measures which eliminate or reduce pollution of stormwater runoff by any chemicals and materials used during the each phase of the construction process. The level of detail will vary with the intensity, size, and type of construction.

2.4.2 SWPPP Outline

An annotated SWPPP outline has been developed and is included in Appendix B of this handbook. The annotated outline contains a suggested outline for SWPPP compliance with the General Permit with a brief description of required elements for each section. Where appropriate, the General Permit section reference is provided for each component of the annotated outline. Local agencies may develop their own SWPPP template/outline or require an alternative format. It is important to note that a SWPPP does not need to match the outline provided. The SWPPP outline is provided as a guidance document that was developed to:

- Identify and provide suggested content for SWPPPs to comply with General Permit requirements.
- Provide consistency in SWPPP content and format, thus making the SWPPP review process more efficient.

An electronic copy of the annotated SWPPP outline (Microsoft Word®) can be downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.

2.5 SWPPP Implementation

2.5.1 Rain Event Action Plans

A Rain Event Action Plan (REAP) is a document designed to protect all exposed portions of the construction site within 48 hours prior to any likely precipitation event. REAPs are prepared by the QSP based on the predicted rain event and construction phase, which include:

- Grading and Land Development;
- Streets and Utilities;
- Vertical Construction; and
- Final Landscaping and Site Stabilization.

REAPs are required for Risk Level 2 and 3 projects, but are a good idea for any project. The REAP should be designed to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants generated for the active site.

The QSP should complete the REAP when there is a forecast of a likely precipitation event in the project area according to the National Oceanic and Atmospheric Administration (NOAA) forecast http://www.crh.noaa.gov/lot/severe/wxterms.php.

NOAA defines the probability of precipitation (PoP) as the likelihood of occurrence (expressed as a percent) of a measurable amount (0.01 inch or more) of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater PoP in the project area. Forecasts are normally issued for 12-hour time periods. REAPs are also required for project sites where construction activities are indefinitely halted or postponed.

An example REAP template has been developed and is included in Appendix C of this handbook. Electronic copies of the REAP template (Microsoft Word®) can be downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.

2.5.2 BMP Inspections

The type of BMP inspection depends on which BMP is implemented. The General Permit requires routine weekly inspections of all BMPs and daily inspections during rain events. However some BMPs may require daily monitoring, such as tracking controls.

In the case of contractor activity BMPs, the monitoring consists of visual inspection to ensure that the BMP was implemented and maintained according to the SWPPP. Such inspection would include:

- Looking for evidence of spills and resulting clean-up (e.g., supplies of spill cleanup materials);
- Verifying adequacy of trash receptacles;
- Verifying waste disposal practices (e.g., recycle bins vs. hazardous waste storage);
- Examining integrity and use of containment structures;
- Verifying use of employee education programs for the various activities; and
- Noting the location of activity (e.g., exposed vs. covered/contained, concrete vs. grass).

In the case of erosion and sediment control BMPs, the inspection program should consist of regular inspection to determine the following:

- Are erosion and sediment control BMPs installed properly? The SWPPP BMPs should include details or references to allow for the proper installation of erosion and sediment control BMPs. The inspector should ensure that these systems are installed according to the SWPPP and in the proper locations.
- Are the BMPs effective? The effectiveness can be assessed by the presence of sediment downstream of the sediment control practice or signs of erosion in stabilized areas after a storm event.
- Have drainage patterns changed? If the site has undergone significant grading operations, resulting in a change of drainage patterns, adjustment to the BMPs will likely be required to address this change. The inspector should determine the extent of changes to the drainage pattern and the necessity for additional or reconfigured BMPs.
- Are areas stabilized in a timely manner after completion of construction activities in an area? Disturbed inactive construction areas must be stabilized. If construction, climatic,

or other site conditions do not allow vegetative stabilization, the SWPPP should define alternative approaches.

- Are the BMPs properly maintained? Maintenance of erosion and sediment control BMPs is critical. Erosion controls should be installed as soon as practical after an area becomes inactive, and before the onset of rain. The capacity of sediment controls must be restored prior to the next rain event.

2.5.3 BMP Maintenance

BMP inspections and visual site monitoring provide the information to determine needed maintenance and the general condition of the installed BMP systems. All maintenance related to a storm event must be initiated within 72 hours of the inspection, and should be completed as soon as possible but preferably before the next predicted storm event. The following maintenance tasks should be performed on a regular basis:

- Removal of sediment from barriers and sedimentation devices;
- Replacement or repair of worn or damaged silt fence fabrics or fiber rolls;
- Replacement or repair of damaged structural controls;
- Repair of damaged soil stabilization measures; and
- Other control maintenance as defined in each BMP fact sheet.

2.5.4 Training

Training is imperative to the success of the BMPs identified in the SWPPP. Adequate training is required if BMPs are to be installed and maintained properly. The General Permit requires that all elements of the SWPPP be implemented under the direction of a QSP. The QSP may delegate tasks to trained employees provided adequate supervision and oversight by the QSP. A construction stormwater pollution prevention training program should be held for all construction personnel. A good program will include:

- **SWPPP Preparation Training.** This training is geared towards engineers, contractors, and water quality professionals involved in preparation of SWPPPs. The training must be obtained from a SWRCB-sponsored or approved QSD training program.

- **SWPPP Implementation Training.** This training is geared towards contractors, superintendents, foremen, and key staff designated in the SWPPP as being responsible for certifications, inspections, monitoring, and project oversight. The training must be obtained from a SWRCB-sponsored or approved QSP training program. Additionally it is recommended that the QSPs for a particular project have on-the-job training that focuses on the SWPPP for the particular project site for which the individual is responsible, including site specific responsibilities, BMPs, and other measures.

- **BMP Implementation Training.** This training is geared towards contractors, superintendents, foremen, tradesmen, and laborers that work on the construction site, including subcontractors. The training should cover responsibilities for BMP implementation, how to implement BMPs, general good housekeeping, and protection of installed BMPs. This training may be provided by the QSPs, professional organizations, the employees' company (e.g. on-the-job training), or by product manufacturers.

Construction water pollution control training typically includes off-site (classroom) and on-site (job-site) training. Off-site training is most appropriate for the formal required SWPPP preparation training and SWPPP implementation training with instruction provided by trainers qualified through the QSD/QSP training program. BMP implementation training is usually conducted on the project site with instruction provided by experienced QSPs.

Subcontractor employees can impact water quality and potentially jeopardize compliance with the SWPPP, thus subcontractor staff must also receive appropriate training. The owner may wish to contractually require that subcontractors employ trained staff.

2.5.5 Construction Site Monitoring

2.5.5.1 Visual Monitoring

Routine periodic and storm event triggered inspections are needed to:

- identify non-stormwater discharges;
- determine BMP effectiveness; and
- identify necessary repairs or BMP changes.

Conducting routine BMP inspections allows for sufficient time for any corrections or improvements to be made before a storm event. Inspections must be conducted by the QSP or an individual under the supervision of and trained by the QSP. Inspection can usually be performed as part of a regular oversight and inspection of the project site.

Corrective actions for problems identified during inspections must be initiated within 72 hours. If a rain event is predicted sooner, the corrective actions should be initiated, and if possible completed, before the forecasted rain event. The result of the inspection and assessment must be written on a checklist provided by the SWRCB or RWQCB or alternate format. At a minimum, each inspection should document the date of the inspection, weather information, site information, observations, descriptions of the inspected BMPs and any deficiencies, the corrective actions that were taken such as BMPs that were fixed or additional BMPs that were implemented, and the inspector's name, title, and signature.

Inspection records must be retained for three years from the date they were generated or submitted (whichever is later) or longer if required by the RWQCB. It is highly recommended that records be retained for at least three years following the date coverage under the General Permit is terminated; even longer retention of records is recommended where sites have been subject to enforcement actions or are involved in litigation regarding issues covered by the General Permit.

2.5.5.2 Water Quality Monitoring

Water quality monitoring is one method of determining the effectiveness of the system of BMPs employed on a construction site. The General Permit requires most project sites to conduct effluent quality monitoring in order to determine: compliance with the applicable NALs or NELs; whether non-visible pollutants are present in the effluent; and whether BMPs are effective or if they need immediate correction or revision.

Effluent sampling and analysis for turbidity and pH is required in addition to visual monitoring for all Risk Level 2 and 3. All sites regardless of risk level may need to conduct non-visible pollutant monitoring if pollutants are exposed and transported off site by stormwater runoff. Risk Level 3 sites are required to sample for Suspended Sediment Concentration (SSC) and conduct receiving water sampling if a NEL is exceeded. Dischargers are not required to collect samples during dangerous weather conditions (e.g., floods, or electrical storms), or outside of scheduled site business hours.

Additional information on the water quality monitoring requirements, including required response actions to exceeding NELs and NALs is provided in Appendix D of this handbook.

Effluent Sampling: Turbidity, pH and Suspended Sediment Concentration

The General Permit requires that dischargers sample every day of every storm event that generates runoff except when the runoff occurs outside of scheduled site business hours. A minimum of three samples are required each day of discharge. The three samples must be representative of the quality of the cumulative discharge from the site. It is advisable to try to collect samples throughout the day, e.g. during the first hour, mid-point, and last hour of each working day. However, it is essential that a minimum of three samples be collected to calculate daily averages. Dischargers should consider taking three discrete measurements at the first sampling event of the day to guarantee that the minimum number of samples is obtained; thereafter one sample can be obtained at the mid-point and end of the day. All sample results (even if more than three are obtained) must be included in the calculation of the daily average or storm event average.

Field meters to measure pH and turbidity allow immediate feedback to the QSP to take action based on the results. For this reason, the use of field meters is preferable to sending pH and turbidity samples to analytical laboratories. Individuals collecting samples need to be appropriately qualified and trained to collect samples and calibrate the field instruments. Continuous monitoring for pH and turbidity is another option that can be employed to provide a more complete representation of effluent quality.

If the daily average turbidity NEL is exceeded at a Risk Level 3 site, the discharger must sample for SSC in all subsequent sampling events. SSC samples must be submitted to a laboratory qualified to perform this analysis.

Effluent Sampling: Non-visible Pollutant Sampling

All construction sites must have a strategy for monitoring non-visible pollutants. As part of the SWPPP, dischargers develop a list of potential pollutant sources based on the site history and the materials that will be used during construction. When these materials are used in a manner that exposes them and they have the potential of entering site runoff, the discharger must sample for them. Preventing or eliminating exposure through the use of BMPs is the best way to avoid non-visible pollutant sampling.

Samples must be collected when a BMP designed to contain or prevent exposure of a non-visible pollutant is breached, malfunctions, or leaks; or a spill occurs that exposes pollutants to runoff. Samples are to be collected within the first two hours of discharge at all affected discharge locations that can be safely accessed. Samples also need to be collected from an area unaffected by the released material to serve as a comparison sample.

It is unlikely that field meters will be able to detect the pollutant parameters, so non-visible samples must be submitted to a certified analytical laboratory for analysis. The Construction Site Monitoring Program in the SWPPP needs to identify the appropriate sampling handling and collection requirements for all potential non-visible pollutants.

Receiving Water Sampling

In the event that a Risk Level 3 site exceeds a NEL (as a daily average) and has a direct discharge into receiving waters, the site must subsequently sample the receiving water. If the pH NEL is exceeded, the receiving water must be monitored for pH. If the turbidity NEL is exceeded, the receiving water must be monitored for turbidity and SSC. Receiving water samples must be collected at a location upstream/upgradient of the effluent discharge point and downstream/downgradient of the effluent discharge point.

The receiving water is the river, stream, lake, estuary, bay, or ocean to which your discharge ultimately flows. In most cases, the MS4 (storm drainage system) or irrigation canal is not the receiving water. A direct discharge is a discharge that is routed directly to a *water of the US* by means of a pipe, channel, ditch (including a MS4), or through surface runoff. Typically a direct discharge is not commingled within the conveyance with runoff and flow from other land uses or other properties.

Bioassessment Monitoring

Bioassessments measure the quality of the stream by analyzing the aquatic life present. Higher levels of appropriate aquatic species tend to indicate a healthy stream, whereas low levels of organisms can indicate stream degradation. Active construction sites have the potential to discharge sediment and pollutants into receiving waters. A bioassessment for sites with the most potential to impact water quality provides a snapshot of the health of the receiving water prior to initiation of construction activities. This snapshot can be used for comparison to the health of the receiving water after construction has been completed.

Each ecoregion (biologically and geographically related area) in the state has a specific yearly peak time where stream biota is most likely in a stable and abundant state. This time of the year is called an index period. Bioassessment consists of benthic macroinvertebrate sampling within the appropriate index period for the project location before commencement of construction activities, and after construction is completed.

Risk Level 3 construction projects equal to or greater than 30 acres and with direct discharges to receiving waters, are required to conduct bioassessment mMonitoring in accordance with the Surface Water Ambient Monitoring Program (SWAMP) http://www.waterboards.ca.gov/water_issues/programs/swamp/.

The SWAMP bioassessment protocols include:

- Collection and reporting of specified in-stream biological data; and
- Collection and reporting of specified in-stream physical habitat data.

Projects that begin outside of the appropriate index period for their area may qualify for a sampling exception and pay into the SWAMP program. The RWQCB must approve the sampling exception. See Appendix E for more information on conducting bioassessments and the requirements for a bioassessment monitoring exception.

2.5.6 Stormwater Pollution Control Documentation

Monitoring and inspection records include: completed inspection checklists; photographs; maintenance records; sampling results; completed REAPs; NAL and NEL exceedance reports; other non-compliance reports; and annual reports. All records must be retained for at least three years from date they were generated or submitted (whichever is later) or longer if required by the RWQCB. It is suggested that records of incidents such as spills or other releases also be kept. Analyzing a history of this information can provide insight into modifying the BMPs. Contractor activity based BMPs, such as Good Housekeeping, must be documented in each inspection; often, this documentation is the only evidence that the BMPs have been implemented.

Section 3
Erosion and Sediment Control BMPs

3.1 Erosion Control

Erosion control is any source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water, or wind. Erosion control consists of using project scheduling and planning to reduce soil or vegetation disturbance (particularly during the rainy season), preventing or reducing erosion potential by diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas. Erosion control BMPs that can be used to fulfill these objectives are shown in Table 3-1. It should be noted that several additional BMPs, such as Check Dams (SE-4) and Fiber Rolls (SE-5) can be used for erosion control, by reducing slope length or steepness, as well as for sediment control (i.e., perimeter control or retention of sediment). These BMPs have been included in this handbook as sediment control BMPs and are shown in Table 3-2.

Table 3-1 Erosion Control BMPs

BMP#	BMP Name
EC-1	Scheduling
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch[1]
EC-4	Hydroseeding[1]
EC-5	Soil Binders[1]
EC-6	Straw Mulch[1]
EC-7	Geotextiles & Mats[1]
EC-8	Wood Mulching
EC-9	Earth Dikes and Drainage Swales
EC-10	Velocity Dissipation Devices
EC-11	Slope Drains
EC-12	Streambank Stabilization
EC-13	Reserved[2]
EC-14	Compost Blankets[3]
EC-15	Soil Preparation / Roughening[3]
EC-16	Non-Vegetative Stabilization[3]

1) BMP fact sheet updated in 2009
2) BMP fact sheet removed in 2009 (formerly PAM)
3) New BMP fact sheet added in 2009

All inactive soil disturbed areas on the project site, and most active areas prior to the onset of rain, must be protected from erosion. Soil disturbed areas may include relatively flat areas as well as slopes. Typically, steep slopes and large exposed areas require the most robust erosion controls; flatter slopes and smaller areas still require protection, but less costly materials may be appropriate for these areas, allowing savings to be directed to the more robust BMPs for steep slopes and large exposed areas. Additional guidance on the selection of temporary slope stabilization methods is provided in Appendix F. To be effective, erosion control BMPs for slopes at disturbed areas must be protected from concentrated flows.

Some erosion control BMPs can be used effectively to temporarily prevent erosion by concentrated flows. These BMPs, used alone or in combination, prevent erosion by intercepting, diverting, conveying, and discharging concentrated flows in a manner that prevents soil detachment and transport. Temporary concentrated flow conveyance controls may be required to direct run-on around or through the project in a non-erodible fashion. Temporary concentrated flow conveyance controls include the following BMPs:

- EC-9, Earth Dikes and Drainage Swales
- EC-10, Velocity Dissipation Devices
- EC-11, Slope Drains

3.2 Sediment Control

Sediment control is any practice that traps soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them.

Sediment control practices include the BMPs listed in Table 3-2.

Sediment control BMPs include those practices that intercept and slow or detain the flow of stormwater to allow sediment to settle and be trapped. Sediment control practices can consist of installing linear sediment barriers (such as silt fences, gravel bag berms, or fiber rolls); and constructing check dams, a sediment trap or sediment basin to retain sediment on site. Linear sediment barriers are typically placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around soil stockpiles, and at other appropriate locations along the site perimeter. As mentioned in Section 3.1, some BMPs are dual-purpose, such as Fiber Rolls and Check Dams. By reducing effective slope length or steepness, these BMPs reduce erosion as well as promote sedimentation.

Table 3-2 Temporary Sediment Control BMPs

BMP#	BMP Name
SE-1	Silt Fence[1]
SE-2	Sediment Basin[1]
SE-3	Sediment Trap
SE-4	Check Dam[1]
SE-5	Fiber Rolls[1]
SE-6	Gravel Bag Berm[1]
SE-7	Street Sweeping and Vacuuming
SE-8	Sandbag Barrier[1]
SE-9	Straw Bale Barrier
SE-10	Storm Drain Inlet Protection[1]
SE-11	Active Treatment Systems[1]
SE-12	Temporary Silt Dike[2]
SE-13	Compost Socks and Berms[2]
SE-14	Biofilter Bags[2]

1) BMP fact sheet updated in 2009
2) New BMP fact sheet added in 2009

Sediment control BMPs are most effective when used in conjunction with erosion control BMPs. The combination of erosion control and sediment control is the most effective means to prevent sediment from leaving the project site and potentially entering storm drains or receiving waters. The General Permit requires that sediment controls be established and maintained at all sites and requires the combined use with erosion controls to protect disturbed areas at most sites.

3.3 Wind Erosion Control

Table 3-3 Wind Erosion Control BMPs

BMP#	BMP Name
WE-1	Wind Erosion Control[1]
1) BMP fact Sheet updated in 2009	

Wind erosion control consists of applying water or other dust palliatives to prevent or minimize dust nuisance. Wind erosion control BMPs are shown in Table 3-3.

Other BMPs that control wind erosion are EC-1 through EC-8, and EC-14 through EC-16, shown in Section 3.1 of this handbook. Be advised that some of the dust palliatives/chemical dust suppression agents may have potential water quality impacts. A sampling and analysis protocol to test for stormwater contamination from exposure to such compounds is required in the SWPPP.

3.4 Tracking Control BMPs

Table 3-4 Temporary Tracking Control BMPs

BMP #	BMP Name
TC-1	Stabilized Construction Entrance/ Exit
TC-2	Stabilized Construction Roadway
TC-3	Entrance/Outlet Tire Wash

Tracking control consists of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. Tracking control BMPs are shown in Table 3-4. Street Sweeping and Vacuuming (SE-7) is also a tracking control practice. All sites must have a stabilized construction entrance and implement controls to prevent off-site tracking of sediment or other loose construction-related materials. These controls should be inspected daily.

Attention to control of tracking sediment off site is essential, as dirty streets and roads near a construction site create a nuisance to the public and can generate complaints to elected officials and regulators. These complaints often result in immediate inspections and regulatory actions.

3.5 Erosion and Sediment Control BMP Fact Sheet Format

A BMP fact sheet is a short document that presents detailed information about a particular BMP. Typically each fact sheet contains the information outlined in Figure 3-1. Fact sheets for each of the above activities are provided in Section 3.6.

The fact sheets also contain side bar presentations with information on BMP categories, targeted constituents, removal effectiveness, and potential alternatives.

EC-xx Example Fact Sheet

Description and Purpose

Suitable Applications

Limitations

Implementation

Costs

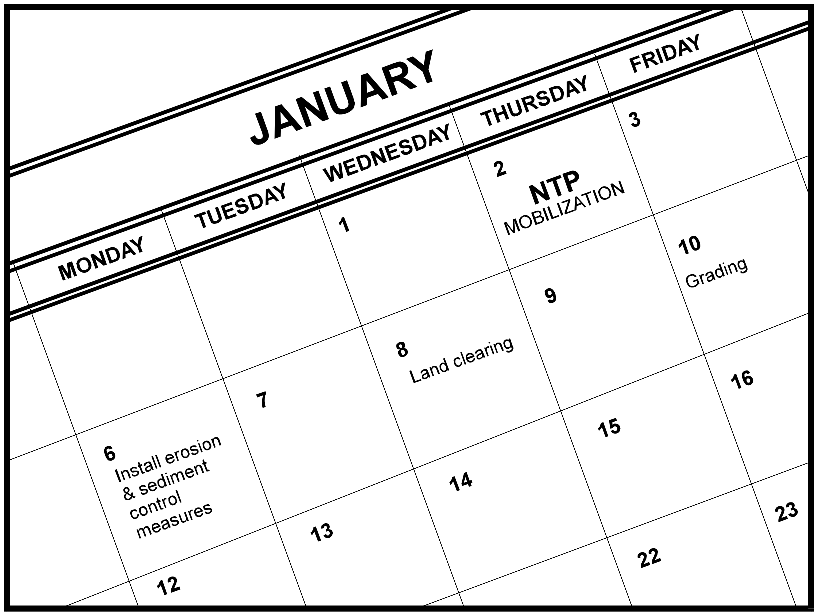
Inspection and Maintenance

References

Figure 3-1
Example Fact Sheet

3.6 BMP Fact Sheets

BMP fact sheets for erosion, sediment, wind, and tracking controls follow. The BMP fact sheets are individually page numbered and are suitable for inclusion in SWPPPs. Copies of the fact sheets can be individually downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

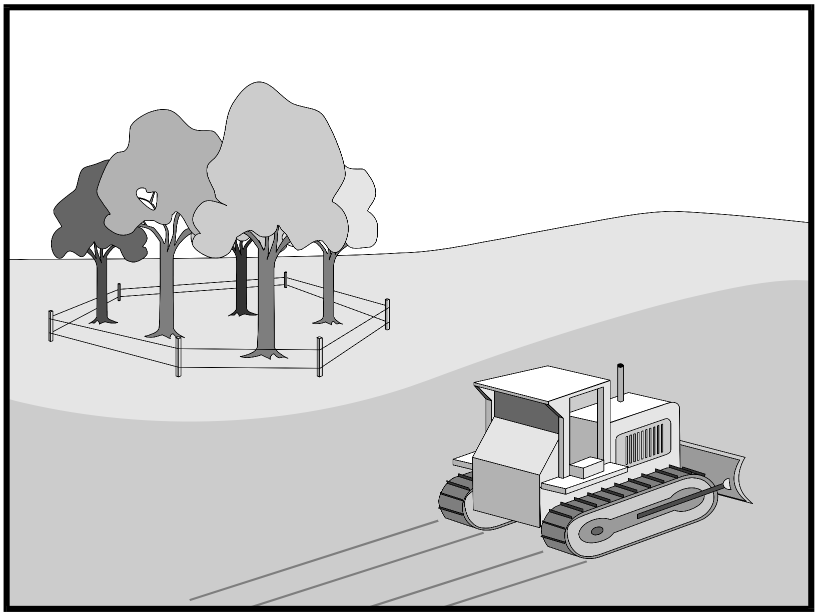
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

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

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

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

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.

- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

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

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

Timing

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

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.

  – Orange colored plastic mesh fencing works well.

  – Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.

- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.

- Consider the impact of grade changes to existing vegetation and the root zone.

- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.

- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

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

Inspection and Maintenance

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

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

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

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

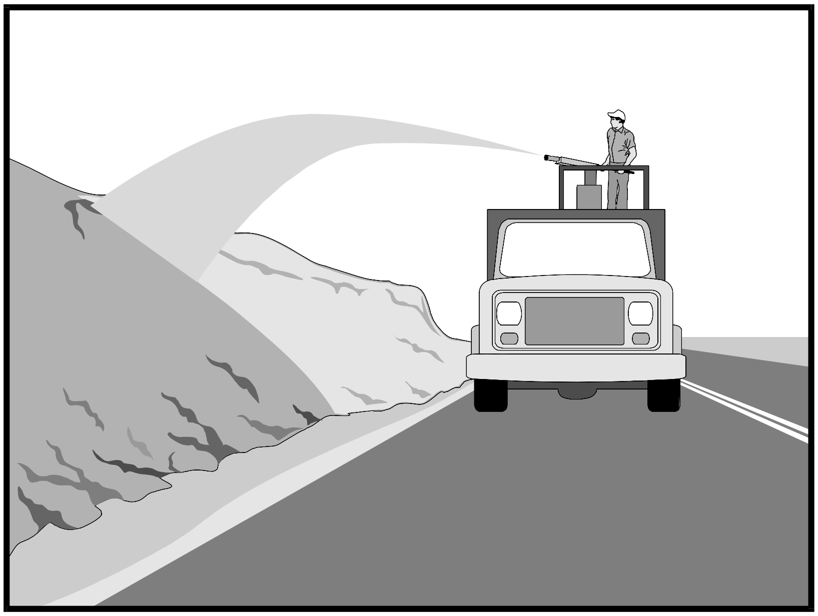
References

County of Sacramento Tree Preservation Ordinance, September 1981.

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

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

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



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

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- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.

- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.

- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.

- Treatment areas must be accessible to hydraulic mulching equipment.

- Availability of water sources in remote areas for mixing and application.

- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.

- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- Cellulose fiber mulches alone may not perform well on steep slopes or in course soils.

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.

- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.

- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.

- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.

- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).

- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.

- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.

- Avoid use of mulch without a tackifier component, especially on slopes.

- Mulches used in the hydraulic mulch slurry can include:

  - Cellulose fiber

  - Thermally-processed wood fibers

  - Cotton

  - Synthetics

  - Compost (see EC-14, Compost Blanket)

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are is provided in Table 1, below.

Table 1
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$1,700 - $3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,000 - $4,000 per acre
PAM-based	$2,500 - $5,610 per acre
Bonded Fiber Matrix (BFM)	$3,900 - $6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	$4,500 - $6,000 per acre
Hydraulic Compost Matrix (HCM)	$3,000 - $3,500 per acre

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.

- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

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

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

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

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

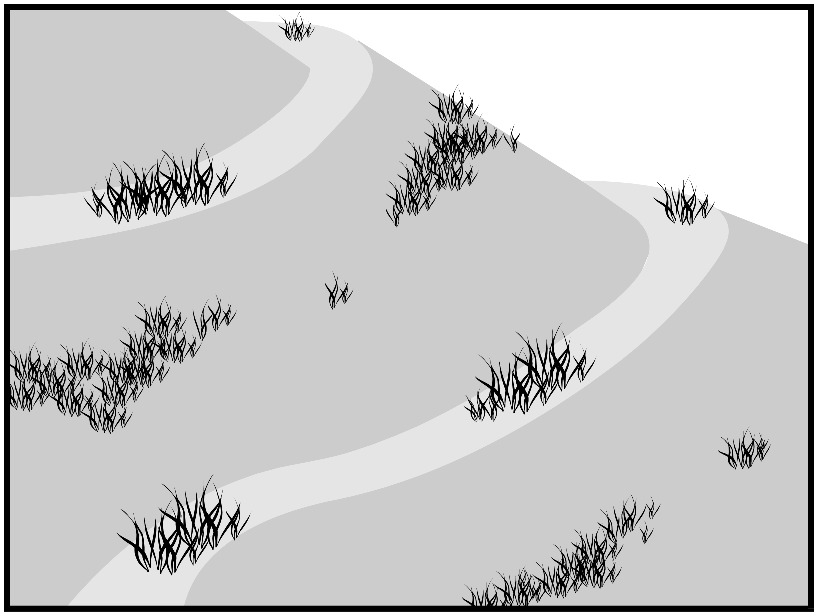
Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

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

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



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.

- Cleared and graded areas exposed to seasonal rains or temporary irrigation.

- Areas not subject to heavy wear by construction equipment or high traffic.

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:

  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

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

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.

- Hydraulic seed can be applied using a multiple step or one step process.

  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).

  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.

- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.

- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.

- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.

- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.

- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

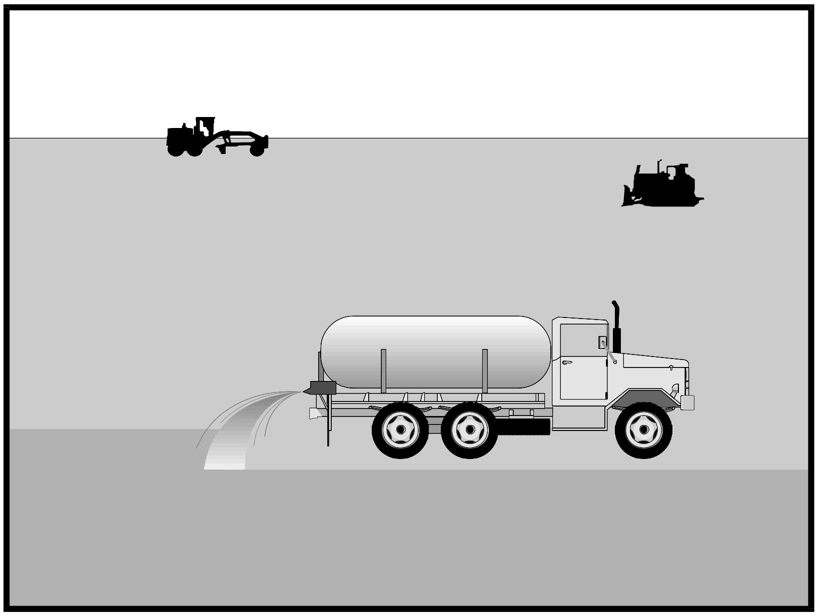
References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

Soil Binders EC-5



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Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

Limitations

- Soil binders are temporary in nature and may need reapplication.

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- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.

- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.

- Soil binders may not sufficiently penetrate compacted soils.

- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.

- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.

- Soil binders may not cure if low temperatures occur within 24 hours of application.

- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.

- Site soil types will dictate appropriate soil binders to be used.

- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.

- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.

  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.

  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide**:** Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:

- Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.

- The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.

- PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".

- PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.

- Prior to application, roughen embankment and fill areas.

- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.

- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.

- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.

- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.

- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd^2 or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd^2.

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Plant-Material-Based (Short Lived) Binders	$700-$900	$770-$990
Plant-Material-Based (Long Lived) Binders	$1,200-$1,500	$1,320-$1,650
Polymeric Emulsion Blend Binders	$700 -$1,500	$770-$1,650
Cementitious-Based Binders	$800-$1,200	$880-$1,350

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	**Plant Material Based (Long Lived)**	**Polymeric Emulsion Blends**	**Cementitious-Based Binders**
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

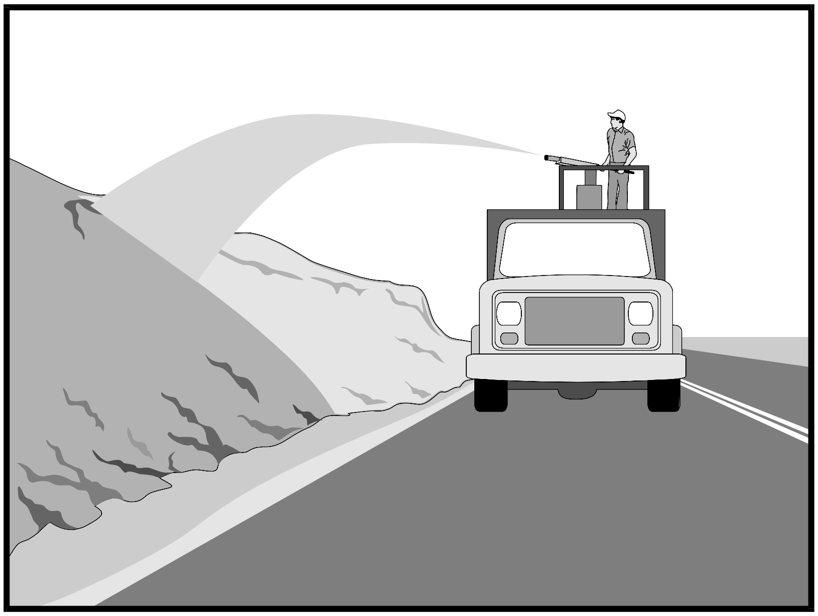
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

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



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

- Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- “Punching” of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.
  - On very small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$2,458-$5,375
Straw mulch with tackifier	$1,823-$4,802

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

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

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

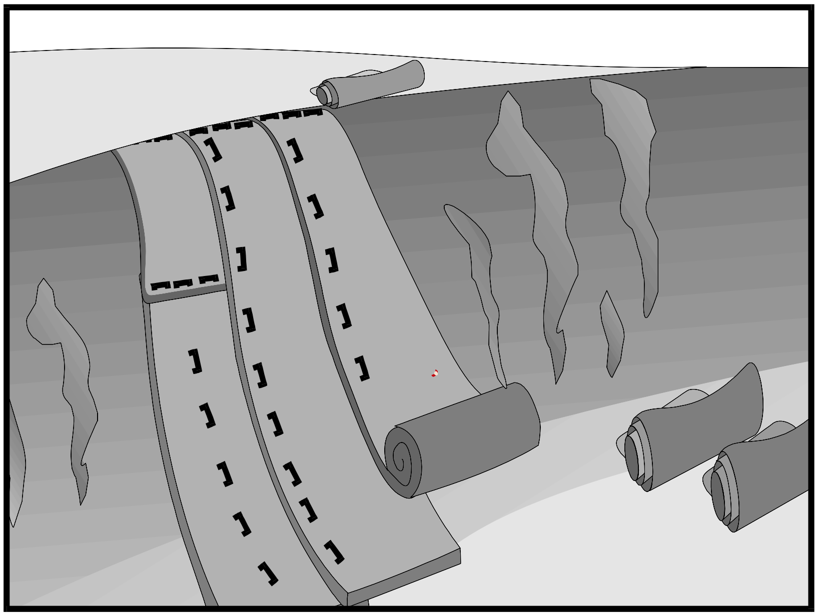
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

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



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Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

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- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

■ Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer’s recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

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

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

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

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

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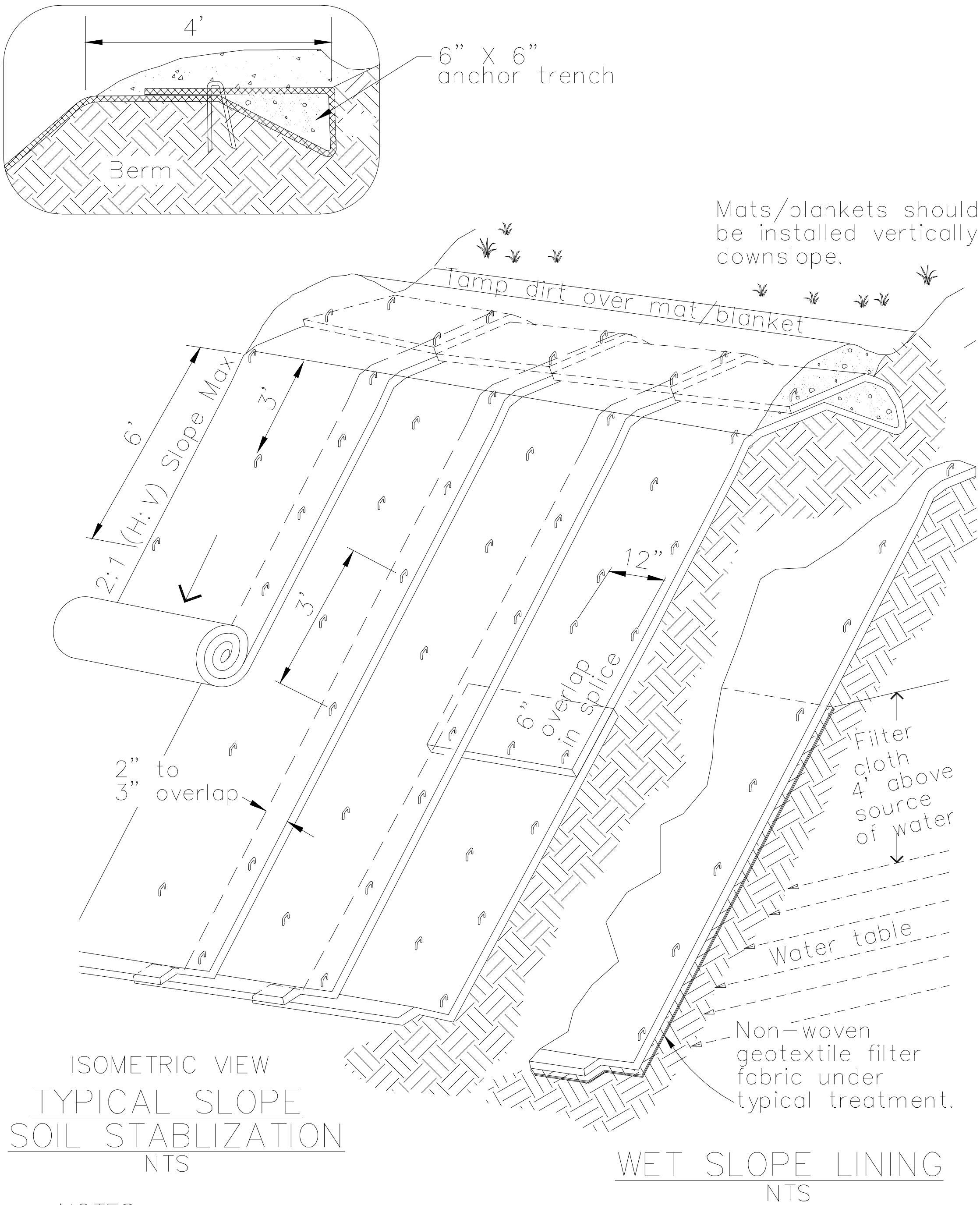
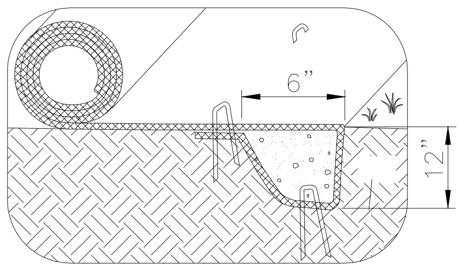


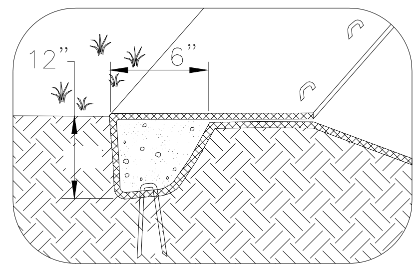
NOTES:

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

TYPICAL INSTALLATION DETAIL



INITIAL CHANNEL ANCHOR TRENCH
NTS



TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
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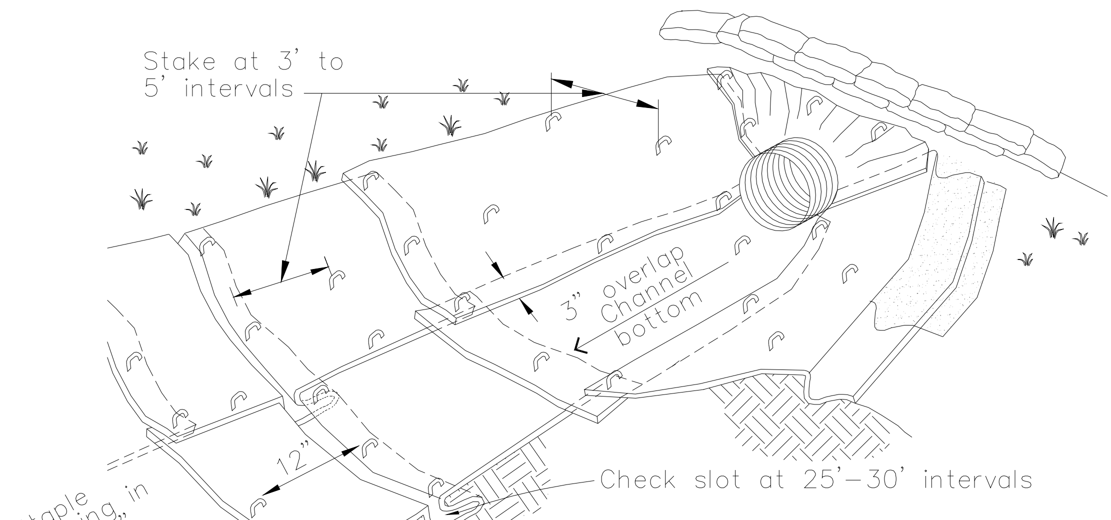
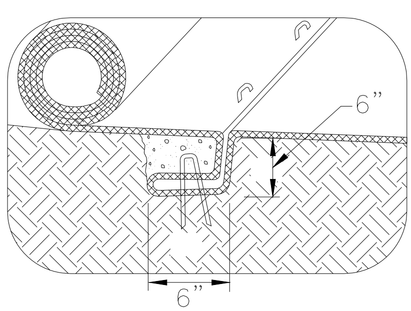


ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
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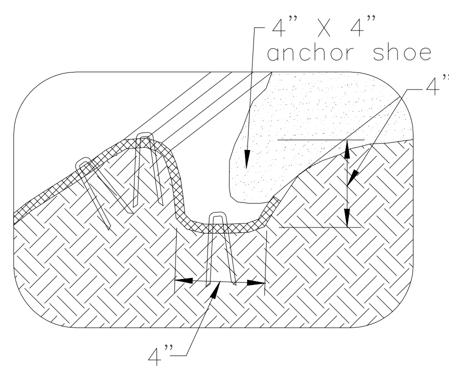

LONGITUDINAL ANCHOR TRENCH
NTS

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

TYPICAL INSTALLATION DETAIL

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Application Procedures

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- Green Material: This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is around $4,000 per acre, but cost can increase if the source is not close to the project site.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

References

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

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

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

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

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

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

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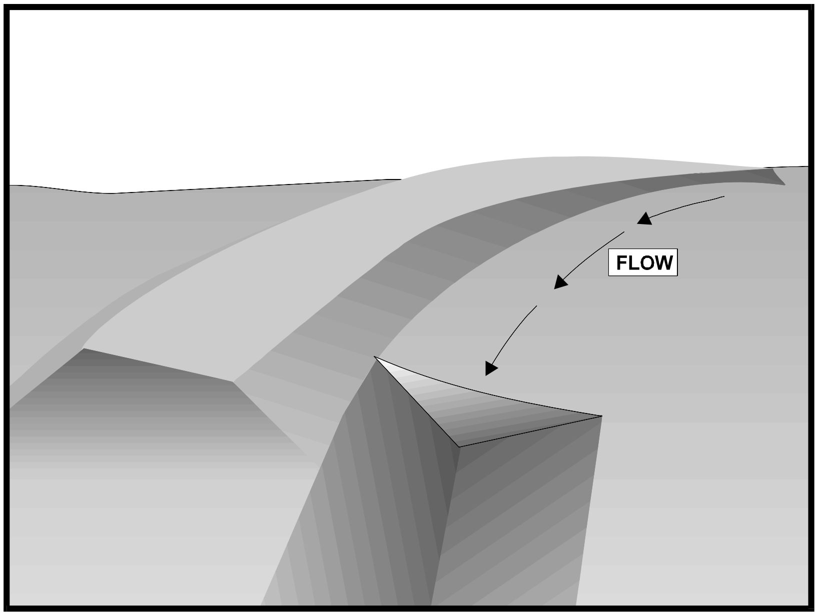

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

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

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- At the top of slopes to divert runon from adjacent or undisturbed slopes

- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows

- Divert sediment laden runoff into sediment basins or traps

Limitations

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

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.

- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.

- Diverted stormwater may cause downstream flood damage.

- Dikes should not be constructed of soils that may be easily eroded.

- Regrading the site to remove the dike may add additional cost.

- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.

- Temporary drains and swales must conform to local floodplain management requirements.

- Earth dikes/drainage swales are not suitable as sediment trapping devices.

- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

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

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

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

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

General

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

Earth Dikes

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

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

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

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

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

Drainage Swales

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

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

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

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

Costs

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

Inspection and Maintenance

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

References

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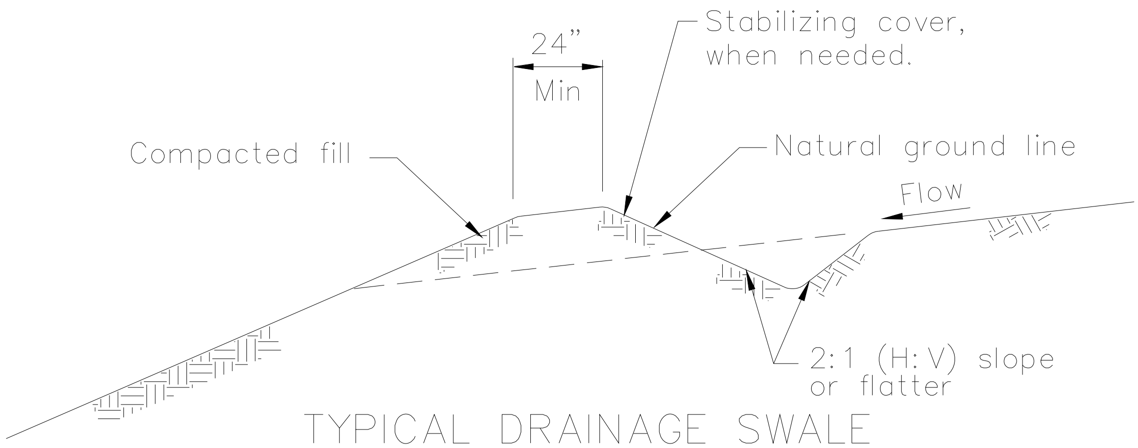
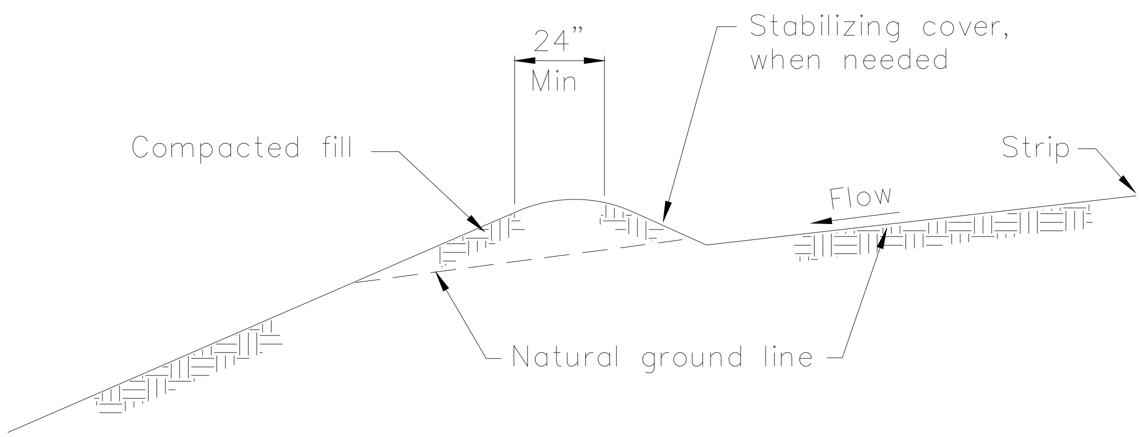
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



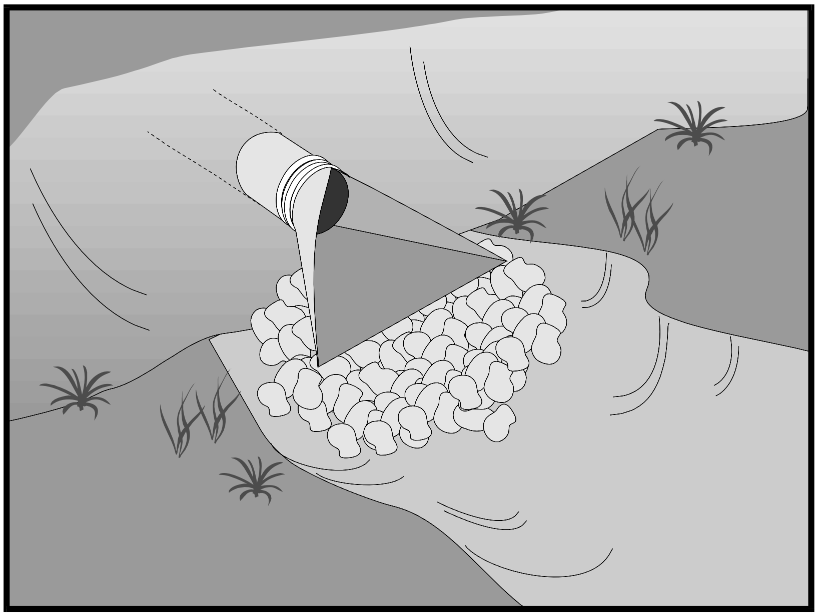
TYPICAL DRAINAGE SWALE
NOT TO SCALE

NOTES:

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



TYPICAL EARTH DIKE
NOT TO SCALE



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

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

Limitations

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

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

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

Design and Layout

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

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

  - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

  - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

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

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

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

Costs

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

Inspection and Maintenance

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

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

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

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

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

References

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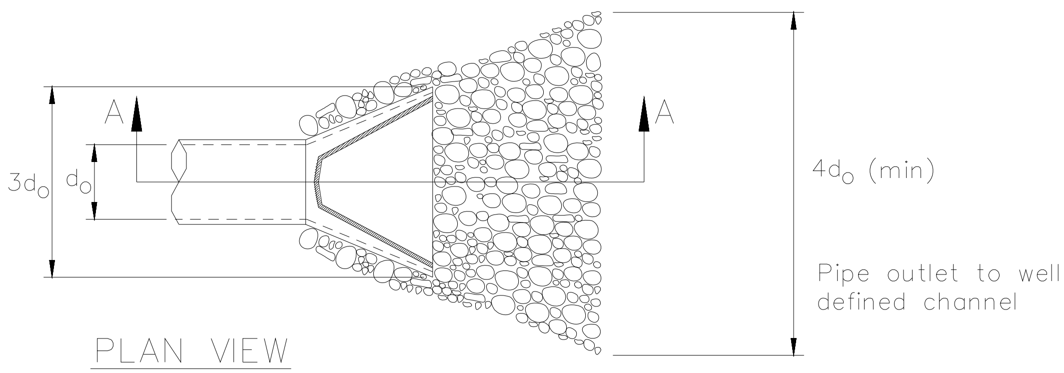
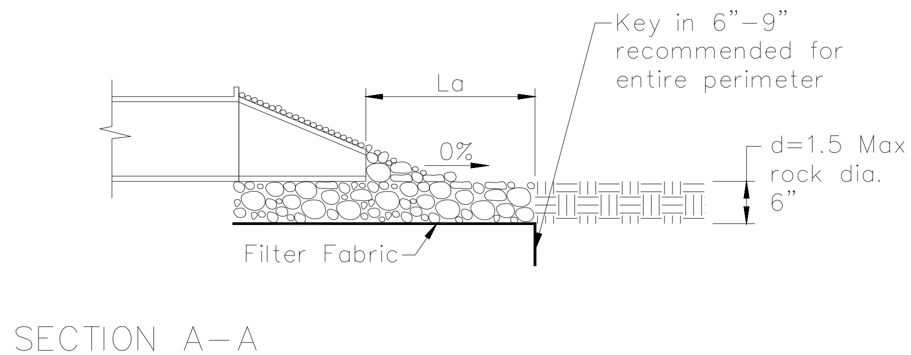
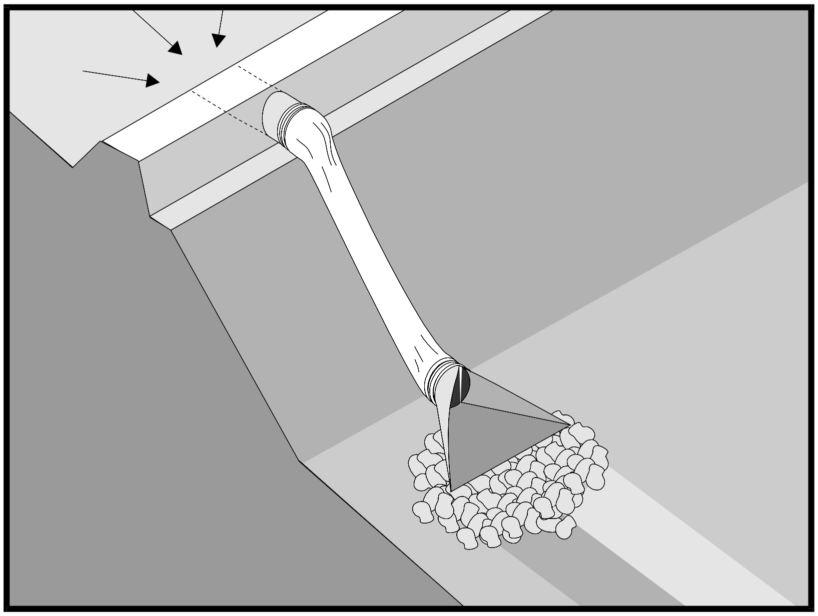




Pipe Diameter inches	Discharge ft^3/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

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



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

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

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

Potential Alternatives

EC-9 Earth Dike, Drainage Swales

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Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.
  - During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe

and causing extreme slope erosion.

- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.

- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.

- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in energy dissipaters associated with slope drain outlets.

Implementation

General

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

Installation

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.

- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.

- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.

- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.

- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.

- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.

- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.

- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.

- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.

- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.

- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.

- Slope drains can be placed on or buried underneath the slope surface.

- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.

- When installing slope drains:

  - Install slope drains perpendicular to slope contours.

  - Compact soil around and under entrance, outlet, and along length of pipe.

  - Securely anchor and stabilize pipe and appurtenances into soil.

  - Check to ensure that pipe connections are watertight.

  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.

  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.

  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

Design and Layout

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

Minimum Pipe Diameter (Inches)	Maximum Drainage Area (Acres)
12	1.0
18	3.0
21	5.0
24	7.0
30	10.0

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

Materials:

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.

- **Flexible Pipe**: The flexible pipe slope drain consists of a flexible tube of heavy duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.

- **Section Downdrains**: The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.

- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

Costs

- Cost varies based on pipe selection and selected outlet protection.

Corrugated Steel Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12”	$19.60 per LF
15”	$22.00
18”	$26.00
24”	$32.00
30”	$50.00
PVC Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12”	$24.50
14”	$49.00
16”	$51.00
18”	$54.00
20”	$66.00
24”	$93.00
30”	$130.00

Inspection and Maintenance

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

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.

- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.

- Inspect pipes for leakage. Repair leaks and restore damaged slopes.

- Inspect slope drainage for accumulations of debris and sediment.

- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

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

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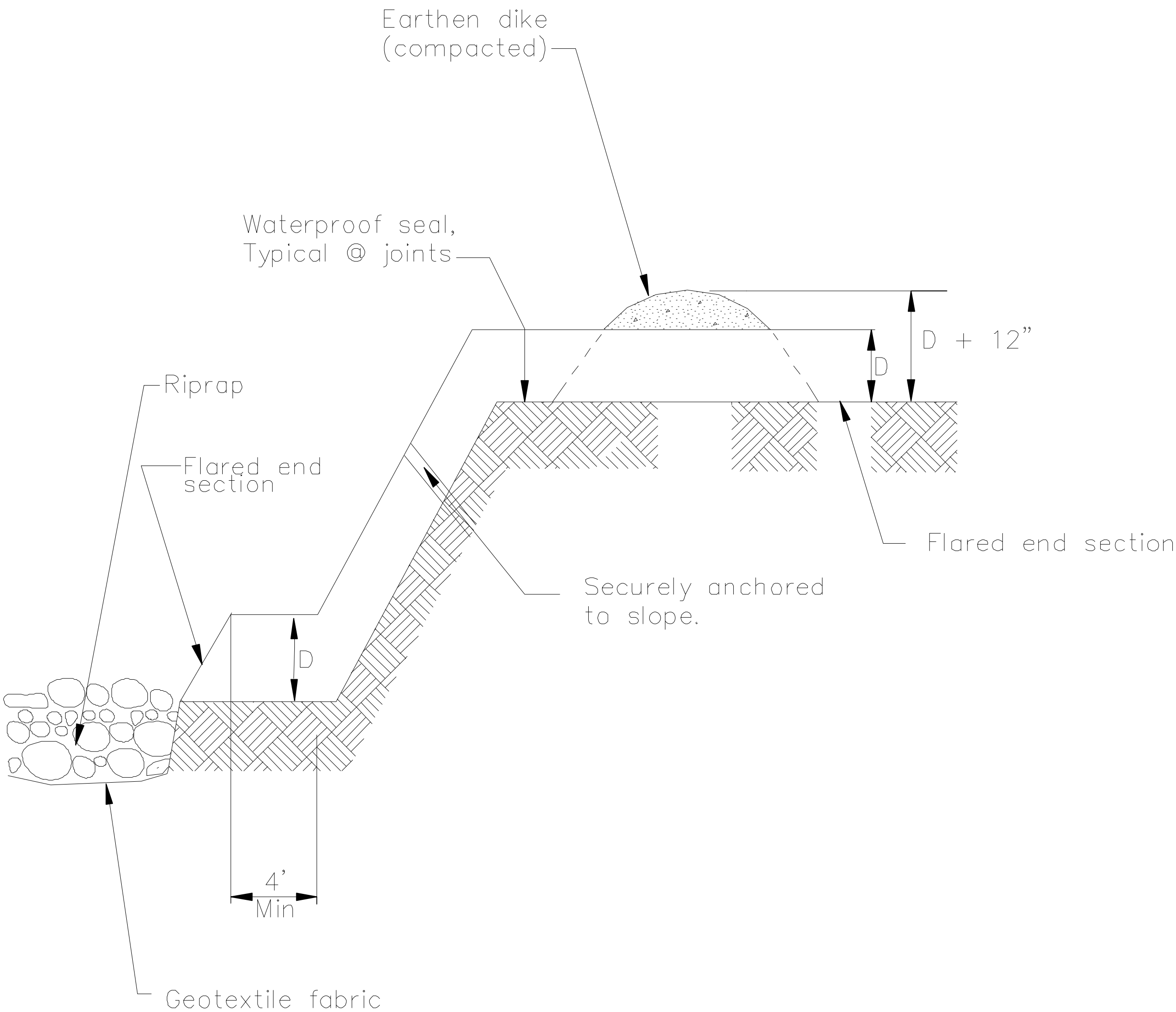

TYPICAL SLOPE DRAIN
NOT TO SCALE

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

Description and Purpose

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

Suitable Applications

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

Limitations

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

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

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

Implementation

Planning

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

Scheduling

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

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

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

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

Minimize Disturbance

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

Use of Pre-Disturbed Areas

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

Selection of Project Site

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

Equipment Selection

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

Streambank Stabilization

Preservation of Existing Vegetation

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

Water Quality Protection

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

Streambank Stabilization

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

Riparian Habitat

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

Limitations

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

Streambank Stabilization Specific Installation

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

Hydraulic Mulch

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

Limitations

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

Hydroseeding

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

Limitations

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

Soil Binders

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

Limitations

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

Straw Mulch

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

Limitations

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

Geotextiles and Mats

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

Earth Dikes, Drainage Swales, and Lined Ditches

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

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.

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

Velocity Dissipation Devices

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

Slope Drains

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

Limitations

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

Streambank Sediment Control

Silt Fences

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

Fiber Rolls

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

Gravel Bag Berm

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

Limitations

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

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence, on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

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

Applications

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

Limitations

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

Specifications

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

Maintenance

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

K-rail

Description and Purpose

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

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

Appropriate Applications

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

Limitations

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

Implementation

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

Instream Construction Sediment Control

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

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

Techniques to minimize Total Suspended Solids (TSS)

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

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

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

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

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

Washing Fines

Definition and Purpose

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

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

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

Appropriate Applications

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

Limitations

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

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

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

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

Implementation

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

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

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

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

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

- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

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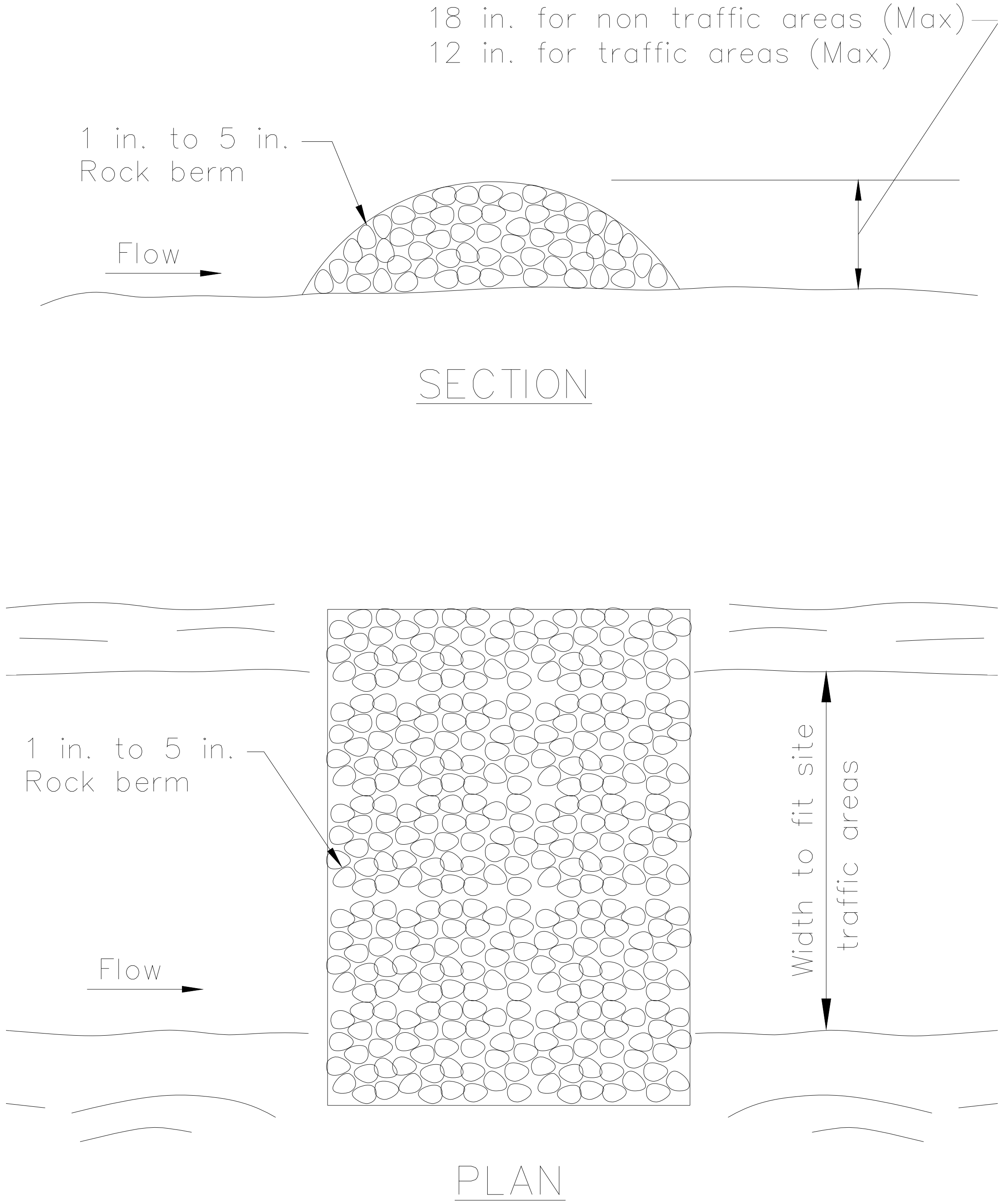

TYPICAL ROCK FILTER
NOT TO SCALE

BMP Factsheet removed in 2009.
Formerly PAM. See SE-11, Active Treatment Systems.

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives

Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

A compost blanket is applied to slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. The compost blanket can be applied by hand, conveyor system, compost spreader, or pneumatic delivery (blower) system. The blanket thickness is determined from the slope steepness and anticipated precipitation. A compost blanket protects the soil surface from raindrop erosion, particularly rills and gullies that may form under other methods of erosion control.

A compost blanket, if properly installed, can be very successful at vegetation establishment, weed suppression and erosion control. The compost blanket comes into direct contact with the underlying soil, reducing rill formation. Furthermore, compost provides organic matter and nutrients important for vegetation growth. The compost blanket provides soil structure that allows water to infiltrate the soil surface and retain moisture, which also promotes seed germination and vegetation growth, in addition to reducing runoff.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly, compost selection is an important design consideration in the application of this type of erosion control.

Suitable Applications

A compost blanket is appropriate for slopes and earth disturbed areas requiring protection until permanent stabilization is established. A compost blanket can also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment. Examples include:

- Rough-graded areas that will remain inactive for longer than 14 days
- Soil stockpiles
- Slopes with exposed soil between existing vegetation such as trees or shrubs
- Slopes planted with live, container-grown vegetation
- Disturbed areas where plants are slow to develop

A compost blanket is typically used on slopes of 2:1 (H:V) or gentler. However, a compost blanket can be effective when applied to slopes as steep as 1:1 (H:V) with appropriate design considerations including slope length, blanket thickness, adding components such as a tackifier, or using compost blankets in conjunction with other techniques, such as compost socks and berms or fiber rolls.

Compost can be pre-seeded prior to application to the soil (recommended by the EPA for construction site stormwater runoff control) or seeded after the blanket has been installed. The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons (USEPA, 1998).

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Carefully consider the qualifications and experience of any compost producer/supplier.
- A compost blanket applied by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of application.
- When blowers are used, the treatment areas should be within 300 ft of a road or surface capable of supporting trucks.
- Wind may limit application of compost and result in application to undesired locations.
- Compost blankets should not be applied in areas of concentrated flows.
- Steeper slopes may require additional blanket thickness and other stability measures such as using tackifiers or slope interruption devices (compost socks and berms, or fiber rolls). The same applies for sites with high precipitation totals or during the rainy season.

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1 below, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).

- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.

- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.

- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should be high-quality mature compost. Immature compost can potentially leach nutrients.

- Compost should not be derived from mixed municipal solid waste and should be free of visible contaminants.

- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

- Compost should not possess objectionable odors.

- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to compost application, prepare the slope by removing loose rocks, roots, stumps, and other debris greater than 2” in diameter. Prepare the slope area surface by scarifying or track walking/roughening if necessary.
- Select method to apply the compost blanket. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- A compost blanket thickness of 1” to 4” should be applied to slopes of 2:1 (H:V) or gentler, based on site-specific conditions. Increase blanket thickness with increased slope steepness and/or during installation during the rainy season (for example, 2” to 3” should be used for a

3:1 slope, while 1” to 2” can be used for a 4:1 slope). Erosion control using a compost blanket is not recommended for slopes greater than 1:1 (H:V).

- For steeper slopes, tackifiers should be utilized and/or other stabilization techniques employed. For example, compost socks or berms can be installed at intervals over the compost blanket (in a similar manner as Fiber Rolls, SE-5).

- Compost socks or berms (or equivalent linear sediment control BMP) should be placed at the top and/or bottom of the slope for additional erosion control performance.

- For optimum vegetation establishment, a blanket thickness of 1” to 2” is recommended. If vegetation establishment is not the primary function of the compost blanket, a thicker blanket may be recommended based on slope or rainfall conditions.

- Evenly distribute compost on the soil surface to the desired blanket thickness (1/2” to 4” as calculated prior based on site conditions and objectives). Even distribution is an important factor in preventing future rill and gully erosion.

- The compost blanket should extend 3 to 6 feet over the top of the shoulder of the slope. A compost sock or compost berm can be used at the top of the slope as an auxiliary technique to prevent runoff from flowing underneath the compost blanket.

- Use additional anchoring and erosion control BMPs in conjunction of the compost blanket as needed.

Costs

The cost associated with a compost blanket is similar to that of a straw mat and generally less expensive than a geotextile blanket (USEPA, 2009). Caltrans has provided a recent estimate for $5,000 to $8,000 per acre for application of an unseeded 1 inch compost blanket (Caltrans Compost Specifications, 2009). Recently obtained vendor costs indicate that proprietary blends of compost that are seeded and contain a nutrient rich “tackifier” can cost approximately $0.35 per square foot, or approximately $15,000 per acre for a 2 inch blanket. Application by hand is more time intensive and likely more costly.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident, another layer of compost should be reapplied as soon as possible. It may be necessary to install an additional type of stormwater BMP at the top of slope or as a slope interrupter to control flow, such as a fiber roll (SE-5) or compost sock (SE-11).

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit or prohibit foot traffic to minimize damage to BMP or impede vegetation establishment.

References

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Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-7 Geotextiles and Mats

CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.

- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.

- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.

- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a "bridging" effect, which suspends the blanket above the seed bed.

- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

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Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Categories

EC	Erosion Control	☑
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TR	Tracking Control	
WE	Wind Erosion Control	☒
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Legend:
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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.

- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.
- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

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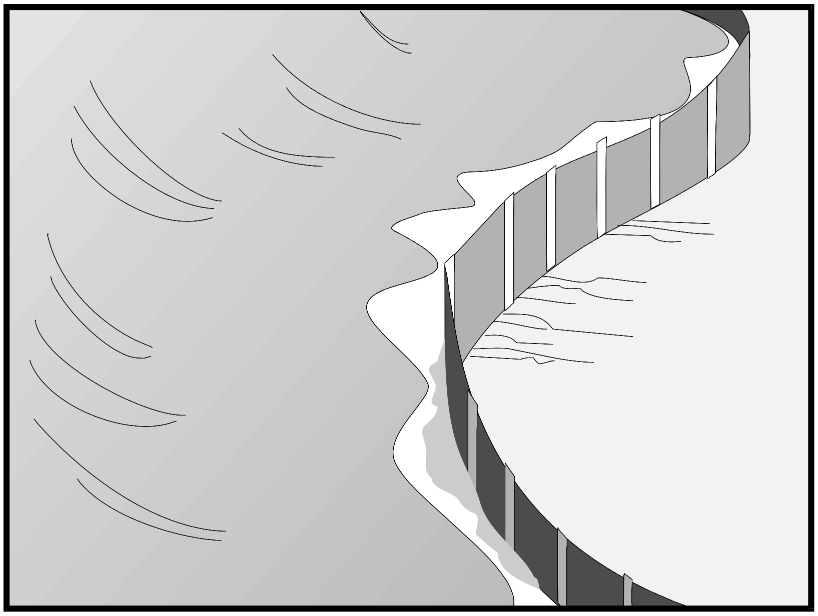

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Targeted Constituents

Sediment	☑
Nutrients	
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Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

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

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

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

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

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

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.

- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.

- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

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

- Layout in accordance with attached figures.

- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.

- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

<u>Standard Silt Fence</u>

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

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

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

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

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

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

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

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

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

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

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
  - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
  - Minimal soil disturbance.
  - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
  - Uniform installation.
  - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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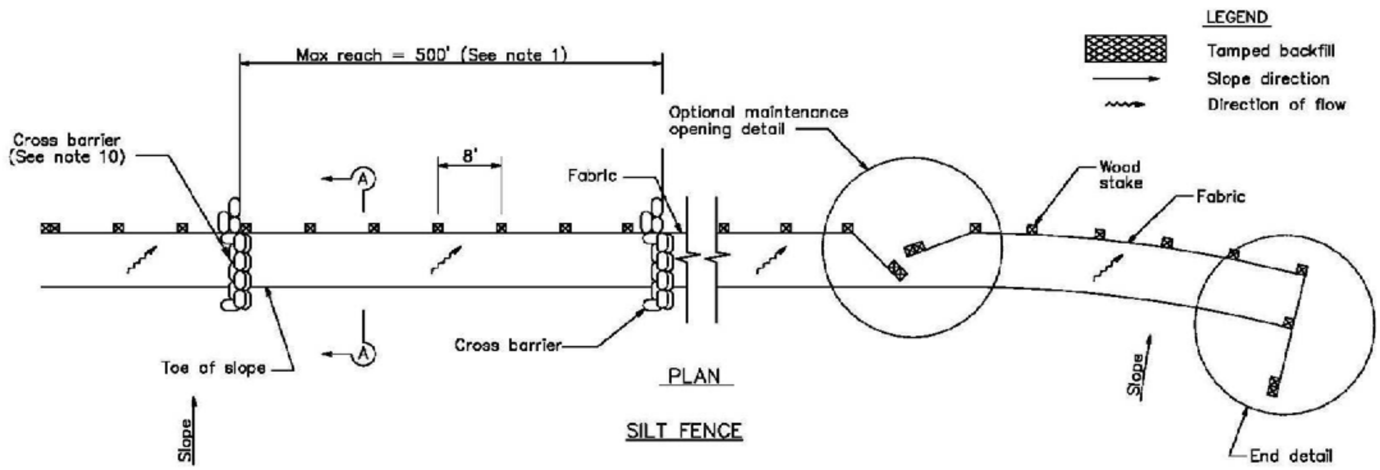
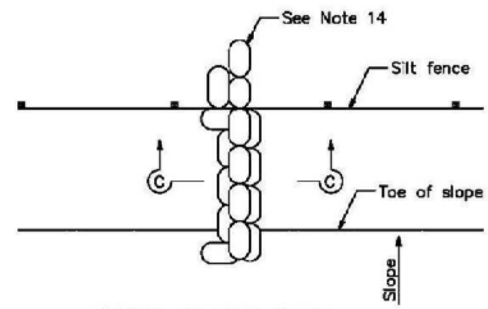
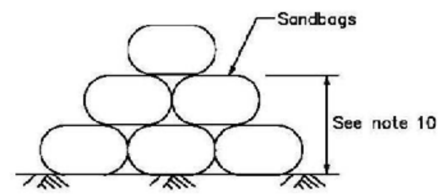


PLAN

SILT FENCE



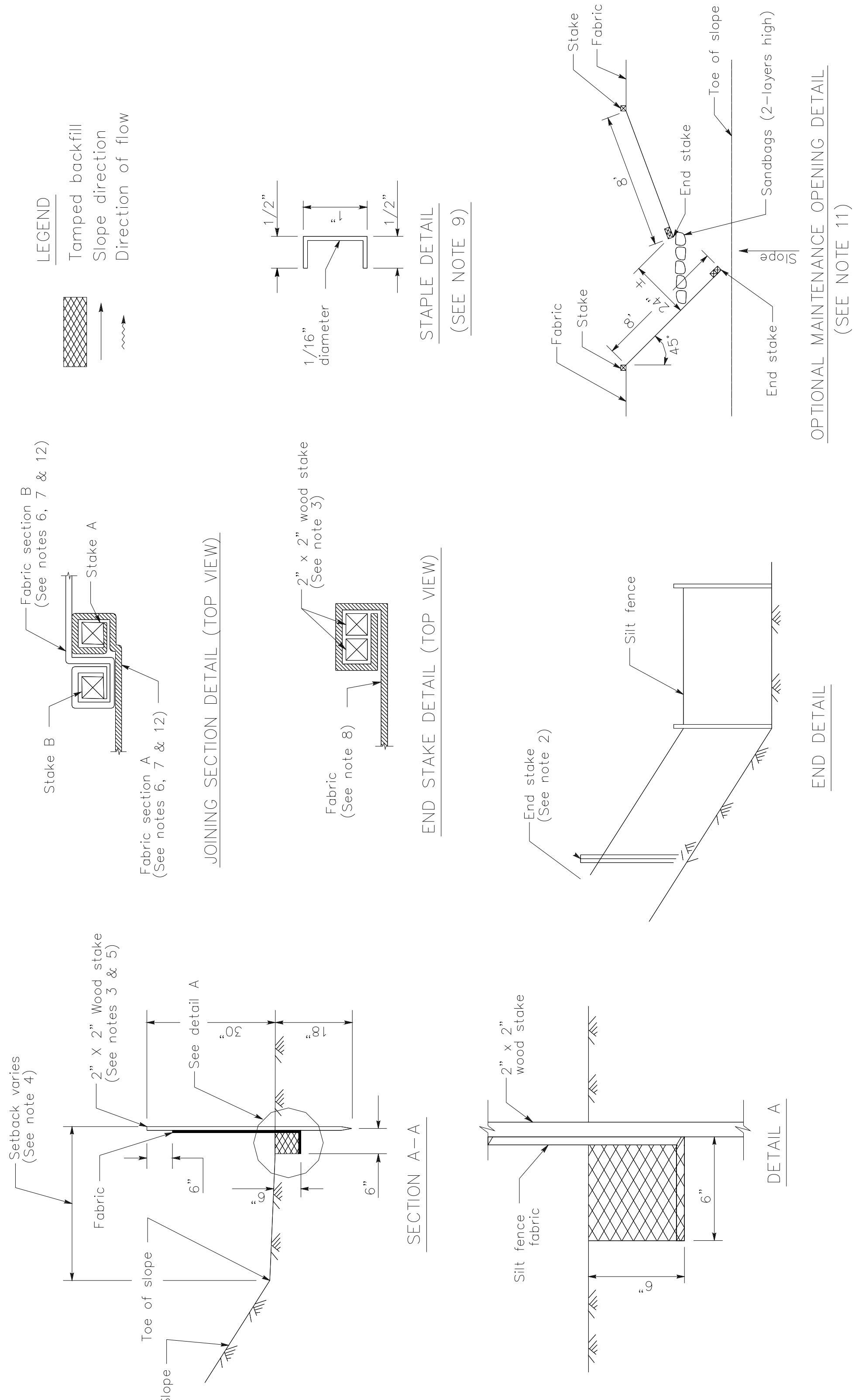
CROSS BARRIER DETAIL



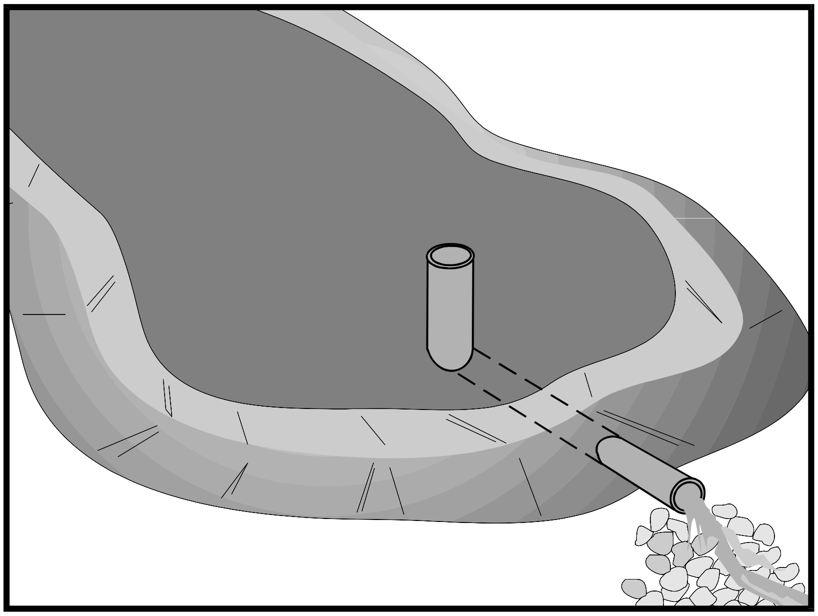
SECTION C–C

NOTES

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



LEGEND
Tamped backfill
Slope direction
Direction of flow
STAPLE DETAIL
(SEE NOTE 9)
1/2"
1"
1/16" diameter
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Stake
Fabric
Toe of slope
End stake
Sandbags (2-layers high)
8'
4'
2'
45°
Slope
JOINING SECTION DETAIL (TOP VIEW)
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
END STAKE DETAIL (TOP VIEW)
2" x 2" wood stake (See note 3)
Fabric (See note 8)
END DETAIL
Silt fence
End stake (See note 2)
SECTION A-A
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
See detail A
30"
18"
Fabric
6"
Toe of slope
Slope
DETAIL A
2" x 2" wood stake
Silt fence fabric



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

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

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site
  and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional (aka "physical") enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These "physical" enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

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

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

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (http://www.water.ca.gov/damsafety/).

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.

- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

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

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

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

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). . The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.

- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.

- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.

- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See "*Step 3. Evaluate the Capacity of the Sediment Basin*"), and should incorporate approaches identified in "*Step 4. Other Design Considerations*" to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \qquad \text{(Eq. 1)}$$

Where:

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

V_s = Settling velocity of the design particle size chosen (V_s = 0.00028 ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$$Q = CIA \qquad \text{(Eq.2)}$$

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

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

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.

- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate discharge. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from http://www.wrcc.dri.edu/pcpnfreq.html).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which discharge is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and Vs is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \qquad \text{(Eq.3)}$$

Where

V_s = Settling velocity in feet per second at 68˚F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation verses discharge (stage-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:

  - An outlet should have more than one orifice.

  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).

  - Orifices can vary in shape.

  - Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.

- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC'A(2gH)^{0.5} \qquad \text{(Eq.4)}$$

Where
Q = Discharge in ft^3/s
C′ = Orifice coefficient (unitless)
A = Area of the orifice (ft^2)
g = acceleration due to gravity (ft^3/s)
H = Head above the orifice (ft)
B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

  - Care must be taken in the selection of orifice coefficient ("C′"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
    - C′ = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
    - C′ = 0.80 when the material is thicker than the orifice diameter

- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event) and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

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

- Floating Outlet Skimmer: The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from http://www.fairclothskimmer.com/.

- Hold and Release Valve: An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be discharged at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.

- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

  $$A = R \times K \times LS \times C \times P \qquad \text{(Eq.5)}$$

  $$Y = 95\left(Q \times q_p\right)^{0.56} \times K \times LS \times C \times P \qquad \text{(Eq.6)}$$

  Where:

  A = annual soil loss, tons/acre-year

  R = rainfall erosion index, in 100 ft.tons/acre.in/hr

  K = soil erodibility factor, tons/acre per unit of R

  LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).

- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.

- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.

- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.

- The basin volume consists of two zones:

  - A sediment storage zone at least 1 ft deep.

  - A settling zone at least 2 ft deep.

  - The basin depth must be no less than 3 ft (not including freeboard).

- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred to as “drawdown time”). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).

- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.

  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.

  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.

- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.

- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.

- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.

- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).

- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.

- Sediment basins are best used in conjunction with erosion controls.

- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.

- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.

- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.

- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.

- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.

- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).

- Areas under embankments must be cleared and stripped of vegetation.

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Examine basin banks for seepage and structural soundness.

- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.

- Check inlet and outlet area for erosion and stabilize if required.

- Check fencing for damage and repair as needed.

- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).

- Remove standing water from basin within 96 hours after accumulation.

- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.

- To minimize vector production:

  - Remove accumulation of live and dead floating vegetation in basins during every inspection.

  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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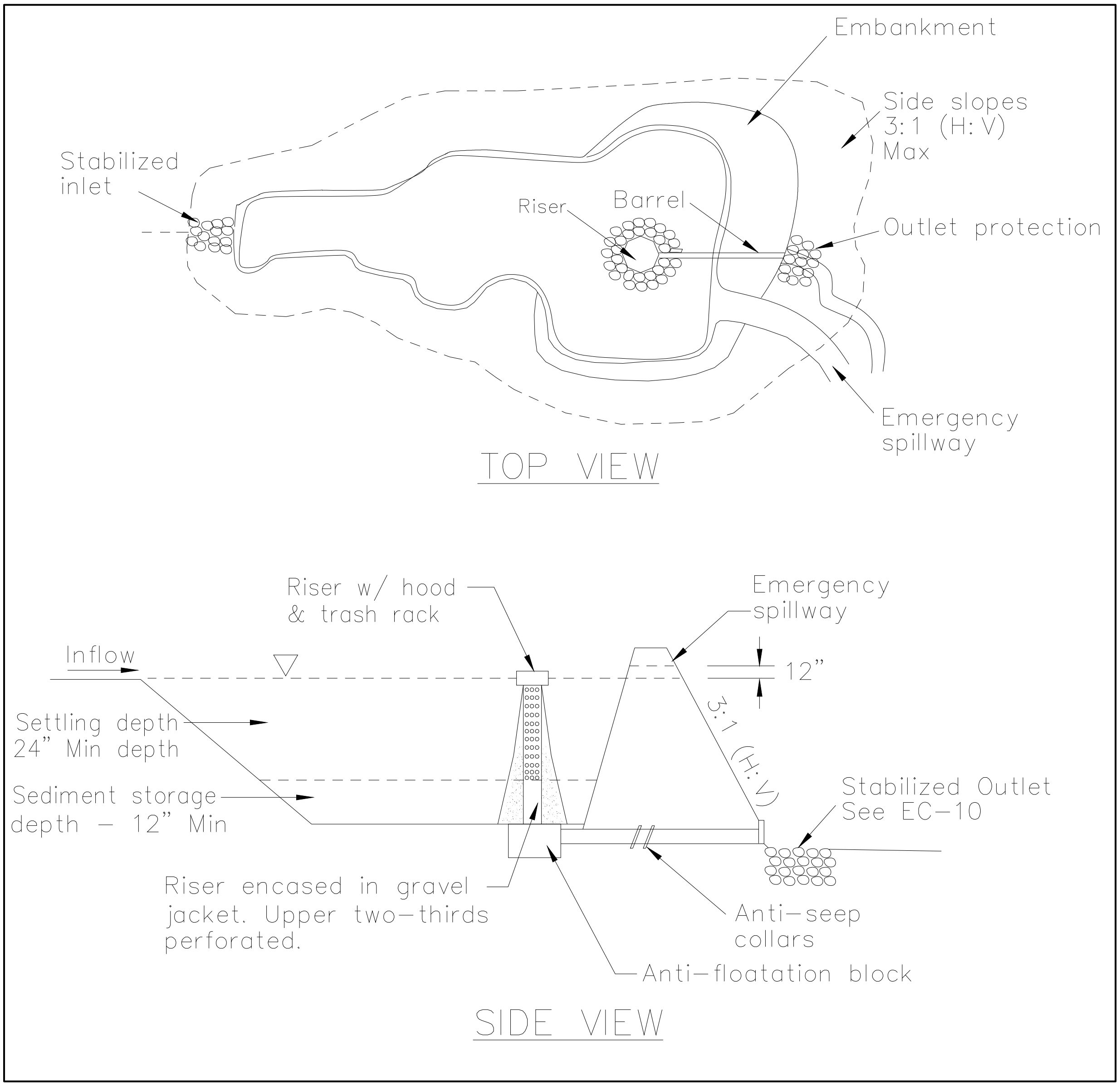


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE

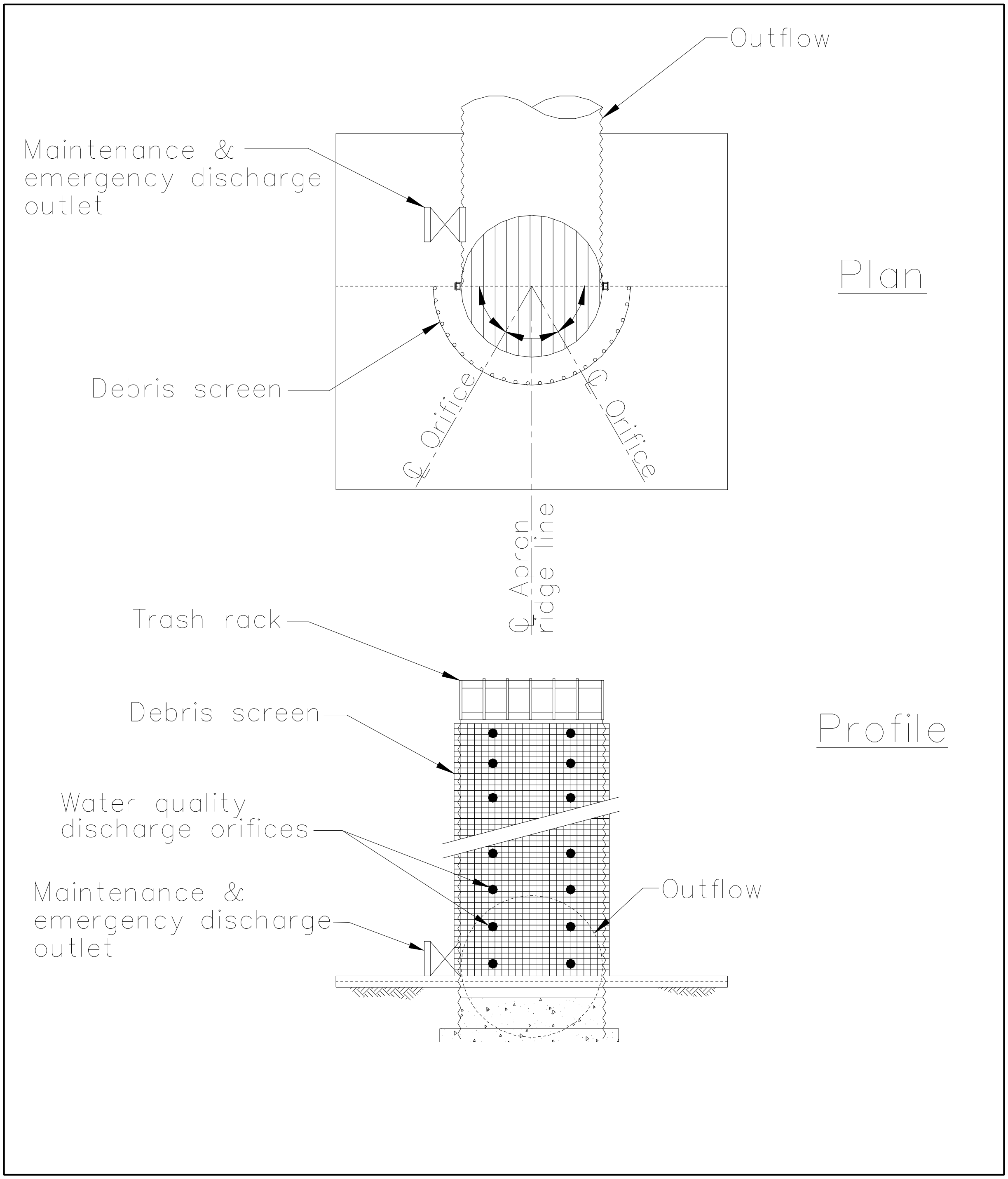


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER
NOT TO SCALE

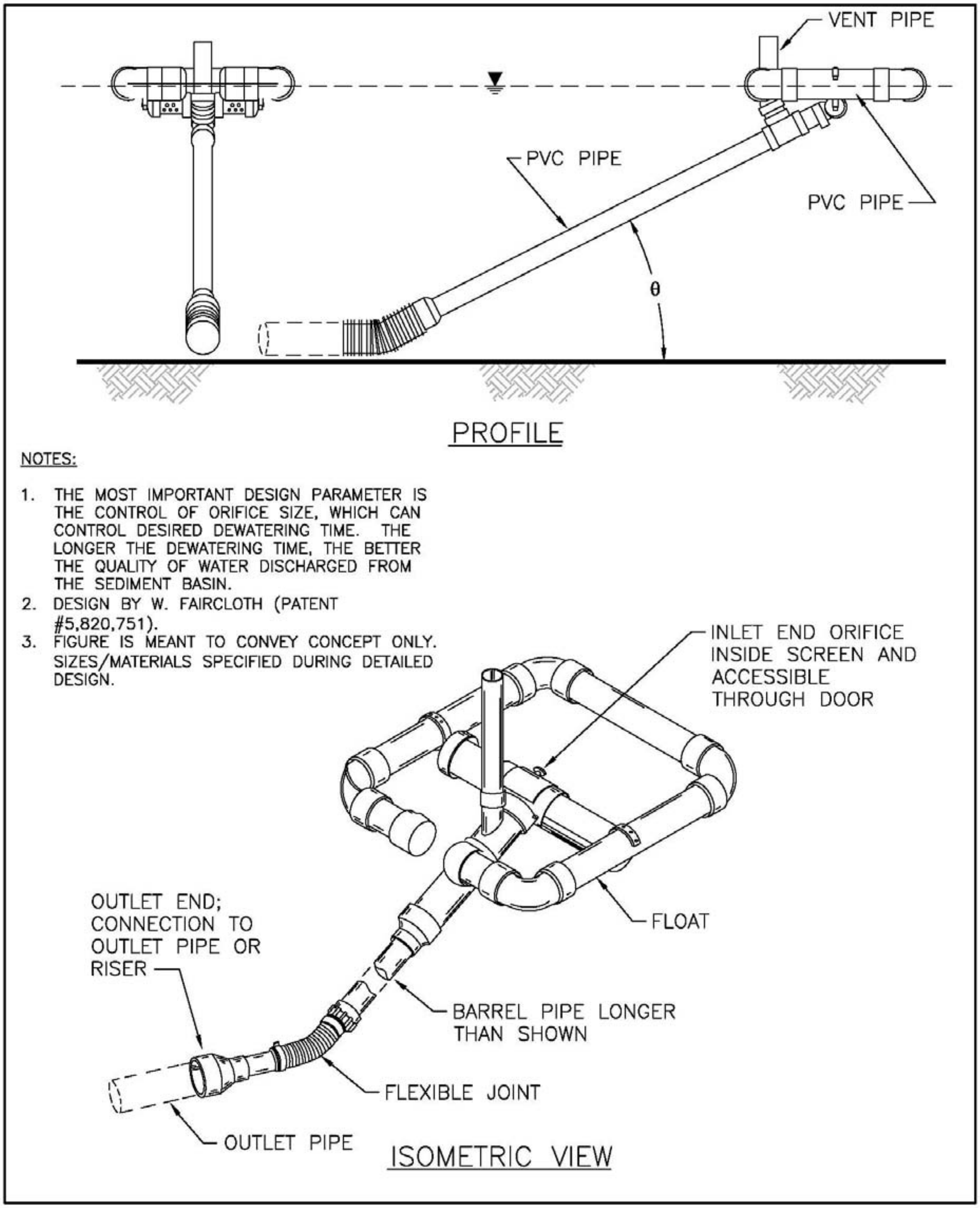


FIGURE 3: TYPICAL SKIMMER

NOT TO SCALE

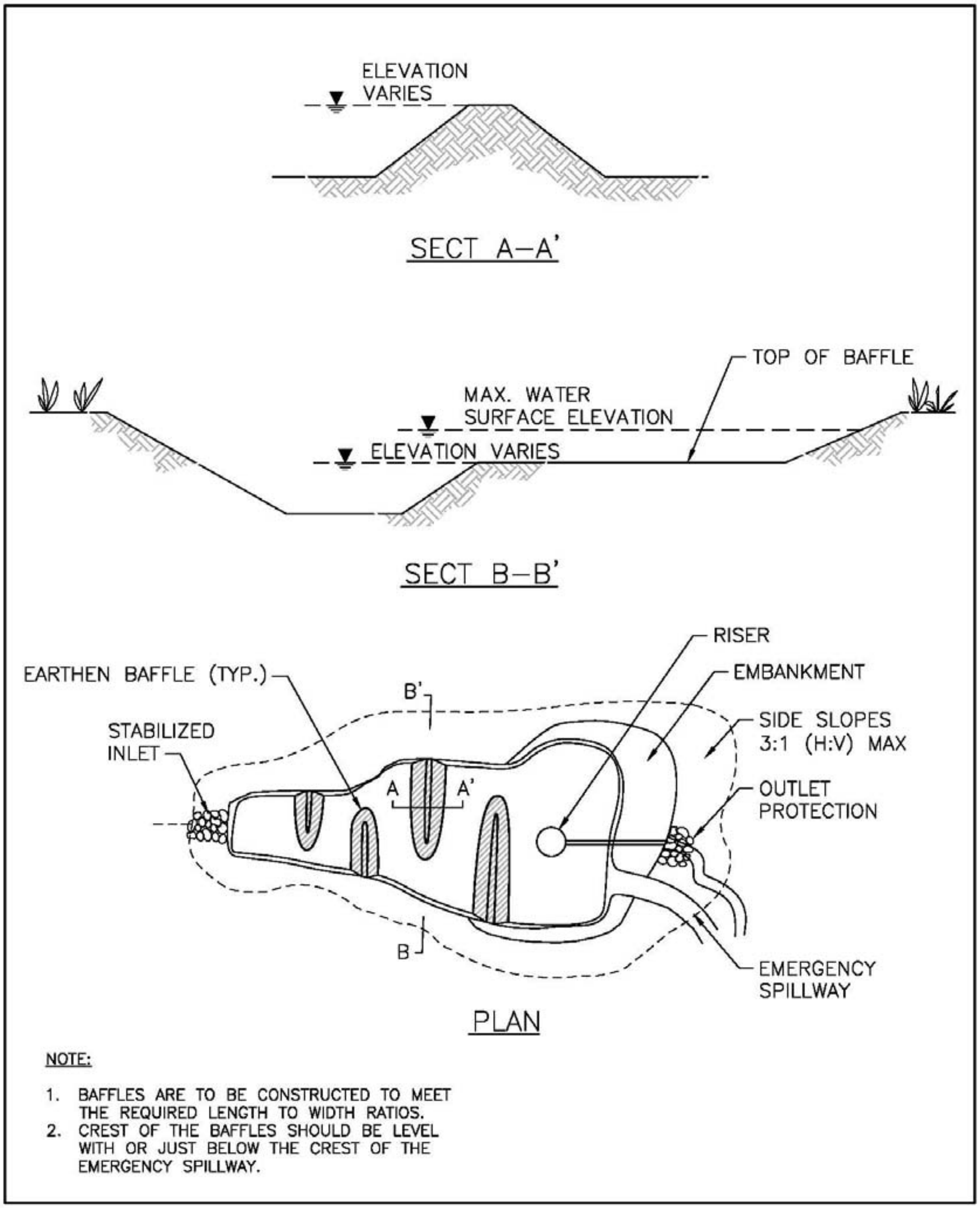
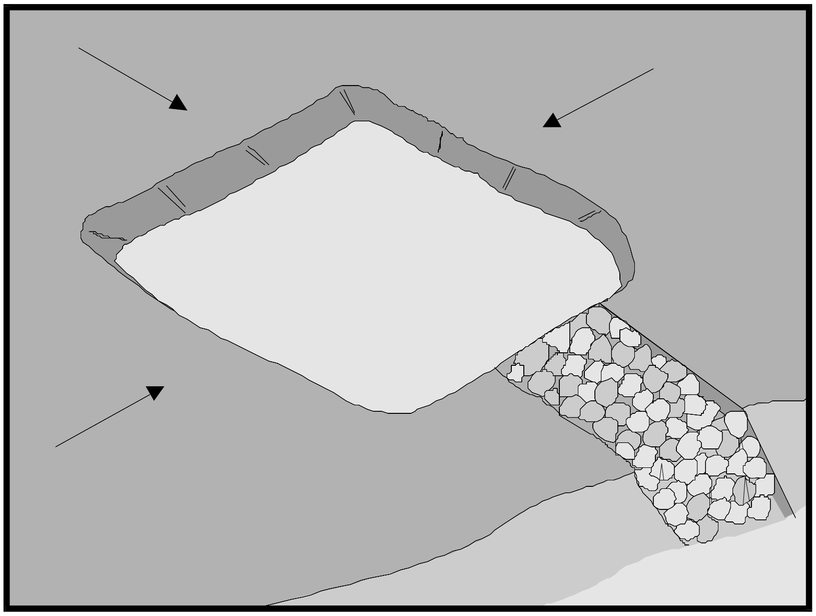


FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN
WITH BAFFLES
NOT TO SCALE



Description and Purpose

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

Suitable Applications

Sediment traps should be considered for use:

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

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

CALIFORNIA STORMWATER QUALITY ASSOCIATION

Limitations

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

Implementation

Design

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

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

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

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

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

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

- Locate sediment traps as near as practical to areas producing the sediment.

- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.

- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.

- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.

- The outlet pipe or open spillway must be designed to convey anticipated peak flows.

- Use rock or vegetation to protect the trap outlets against erosion.

- Fencing should be provided to prevent unauthorized entry.

Installation

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

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.

- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.

- All cut-and-fill slopes should be 3:1 or flatter.

- When a riser is used, all pipe joints must be watertight.

- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.

- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

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

Costs

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

Inspection and Maintenance

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

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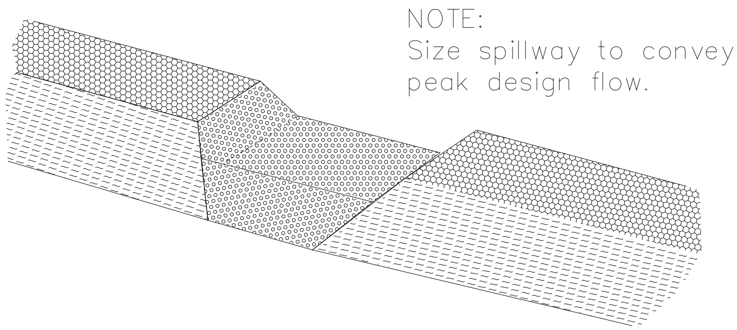
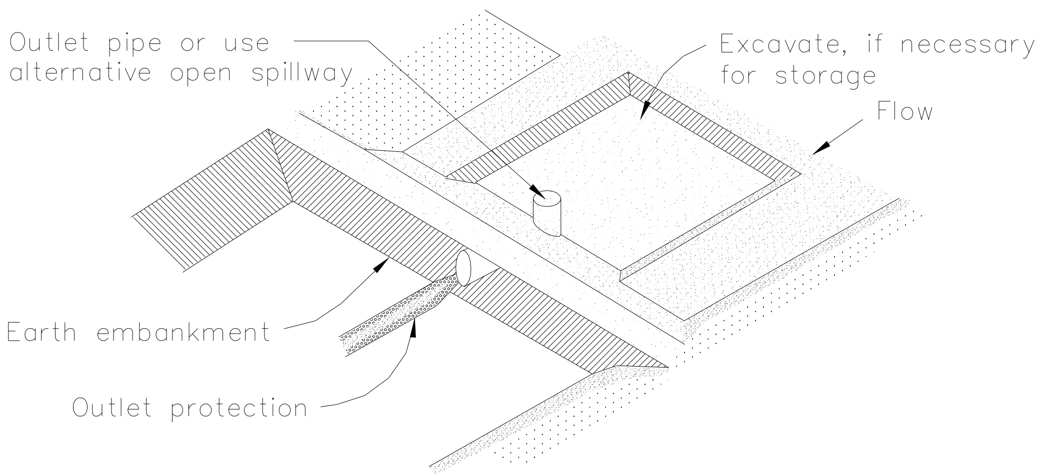
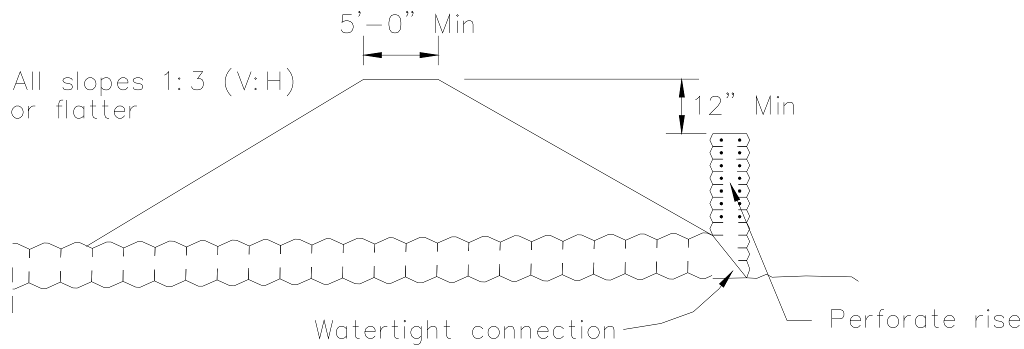


TYPICAL OPEN SPILLWAY

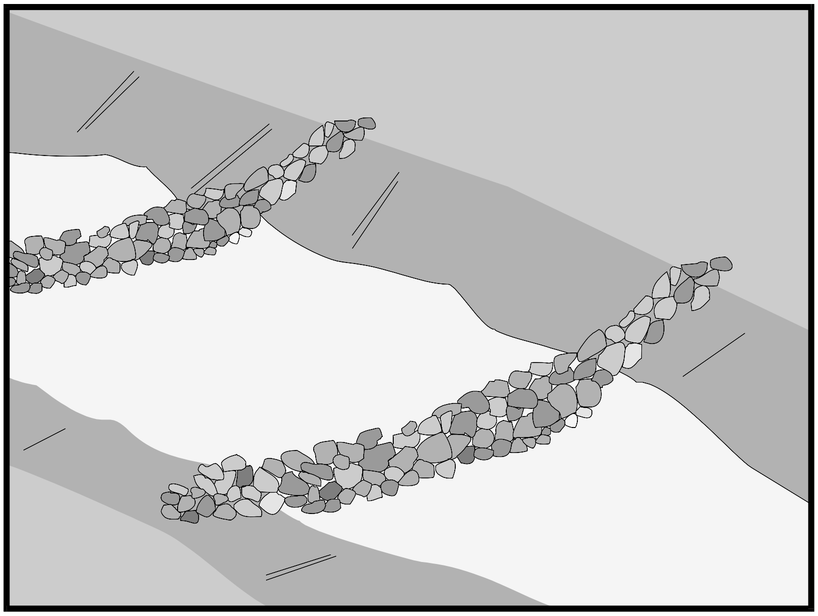




EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Check Dams SE-4



Categories

EC	Erosion Control	☒
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

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

Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

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

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

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of the ditch or swale (see “Typical Rock Check Dam” detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

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

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see “Gravel Bag Check Dam” detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer’s instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

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

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

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.

- Check dams should be placed at a distance and height to allow small pools to form between each check dam.

- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.

- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.

- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.

- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.

- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.

- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.

- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.

- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.

- Upper rows or gravel and sand bags shall overlap joints in lower rows.

- Fiber rolls should be trenched in, backfilled, and firmly staked in place.

- Install along a level contour.

- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

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

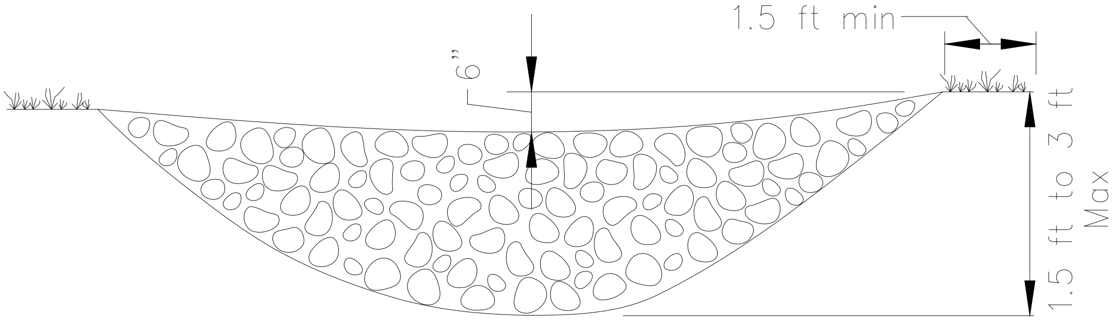
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

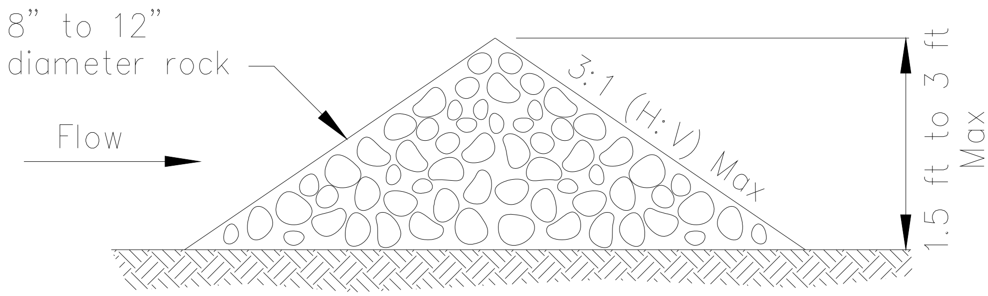
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

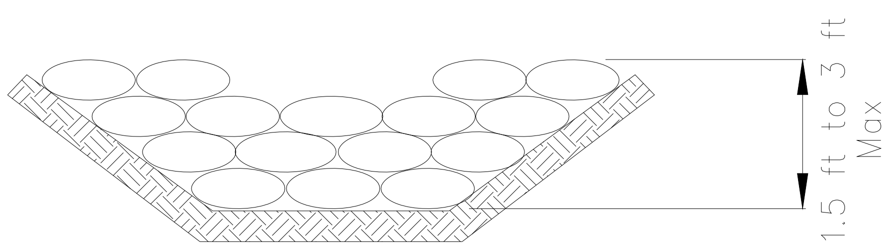


ELEVATION

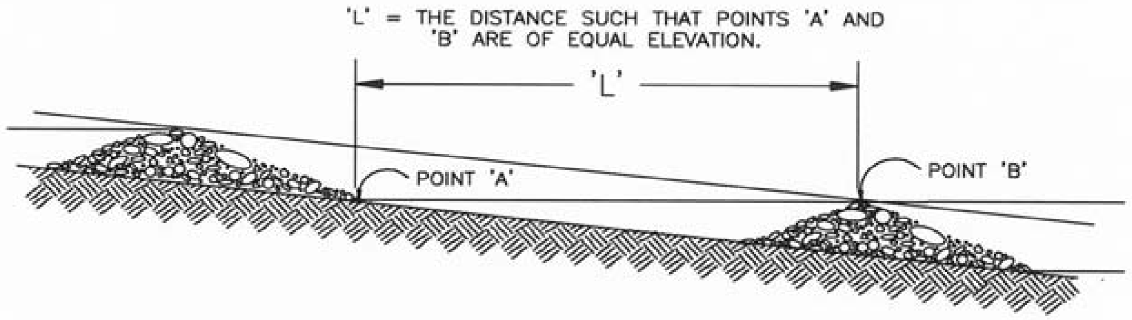


TYPICAL ROCK CHECK DAM SECTION

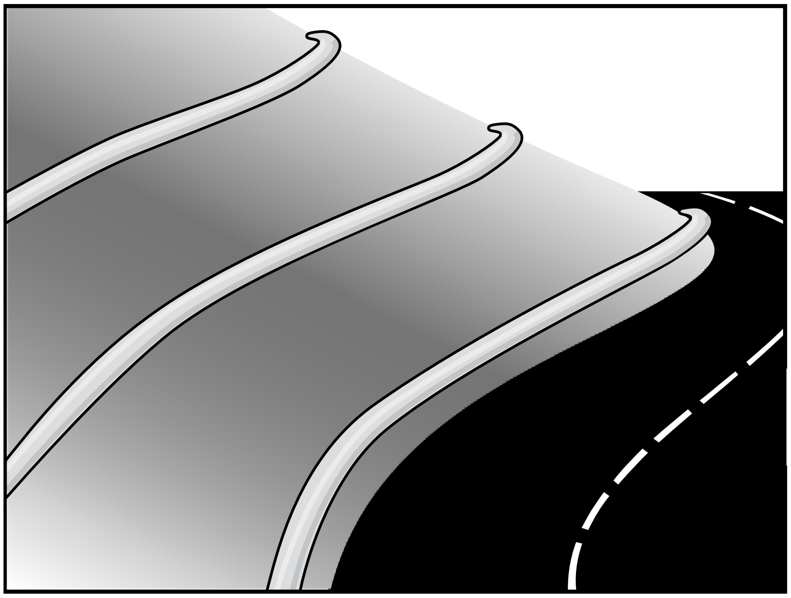
ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.

- Start building trenches and installing rolls from the bottom of the slope and work up.

- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.

- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.

- Stake fiber rolls into the trench.

  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.

- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

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

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Repair or replace split, torn, unraveling, or slumping fiber rolls.

- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

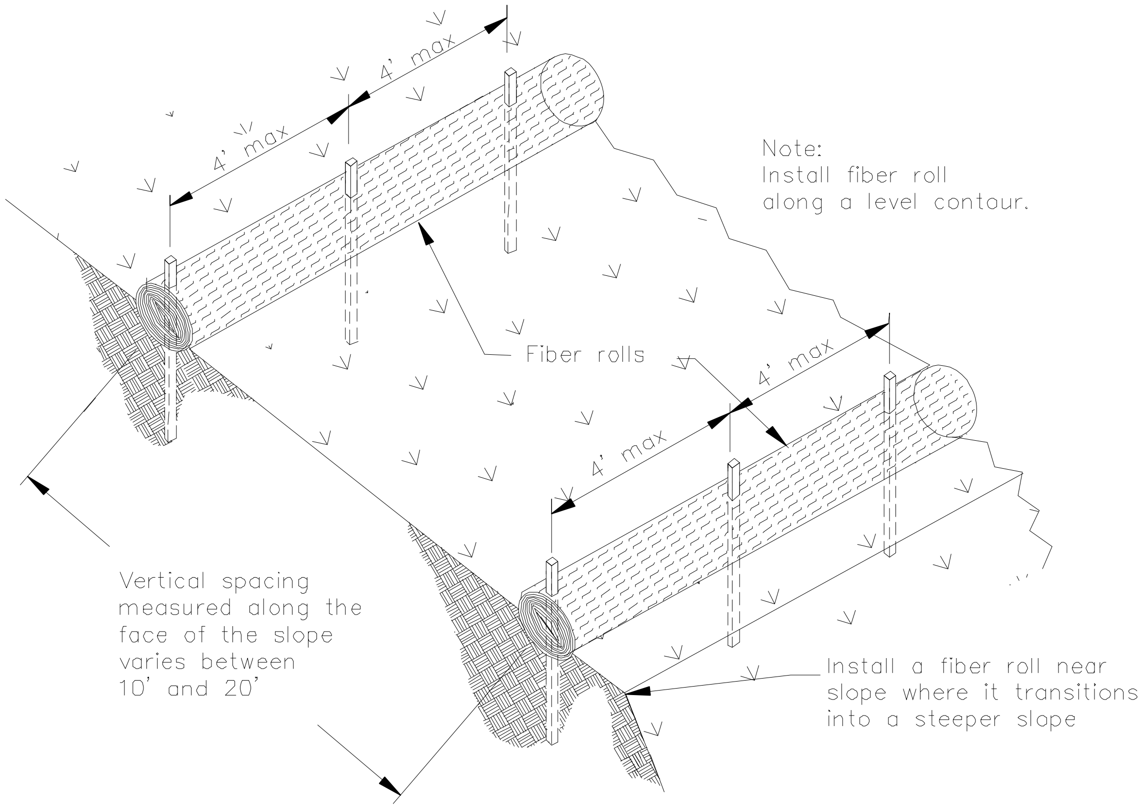
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

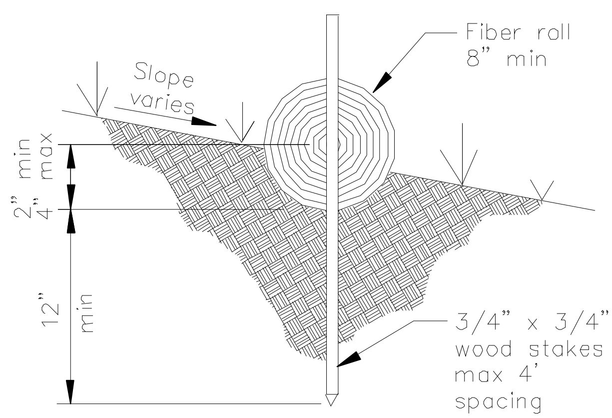
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

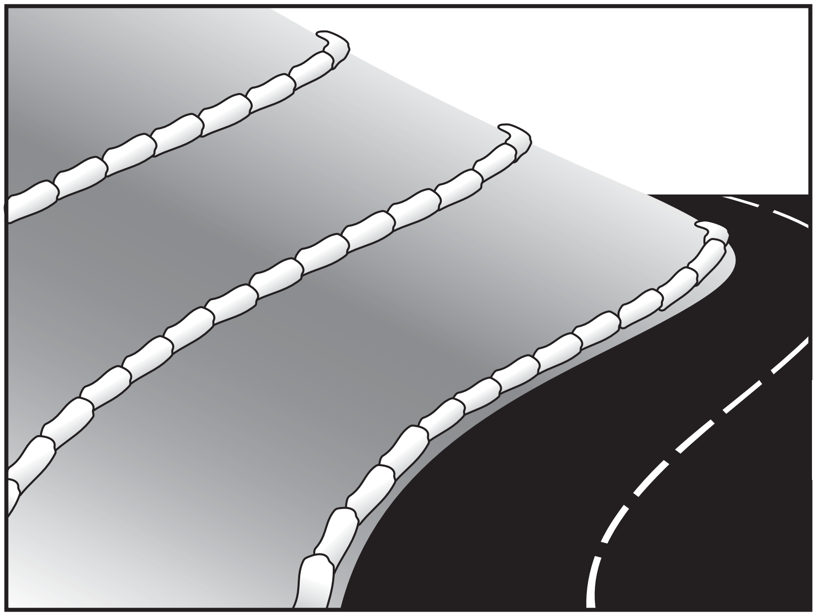


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm — SE-6



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

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

Suitable Applications

Gravel bag berms may be suitable:

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

- At the top of slopes to divert runoff away from disturbed slopes.

- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:

  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.

  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs
Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

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

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Description and Purpose

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

Suitable Applications

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

Limitations

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

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.

- Inspect potential sediment tracking locations daily.

- Visible sediment tracking should be swept or vacuumed on a daily basis.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

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

Inspection and Maintenance

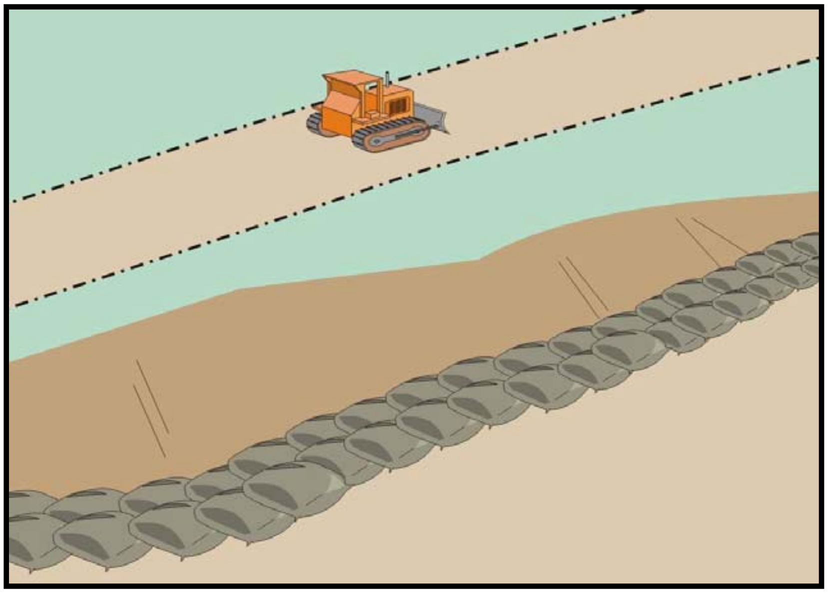
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed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

References

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

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

Sandbag Barrier SE-8



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

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

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-14 Biofilter Bags

Description and Purpose

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

Suitable Applications

Sandbag barriers may be suitable:

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

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

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Sand is easily transported by runoff if bag is damaged or ruptured.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months. When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

    Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.

- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.

- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.

- Drainage area should not exceed 5 acres.

- Stack sandbags at least three bags high.

- Butt ends of bags tightly.

- Overlap butt joints of row beneath with each successive row.

- Use a pyramid approach when stacking bags.

- In non-traffic areas
    - Height = 18 in. maximum
    - Top width = 24 in. minimum for three or more layer construction
    - Side slope = 2:1 (H:V) or flatter

- In construction traffic areas
    - Height = 12 in. maximum
    - Top width = 24 in. minimum for three or more layer construction.
    - Side slopes = 2:1 (H:V) or flatter.

- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.

- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) permeable material free from clay and deleterious material, such as recycled concrete or asphalt..

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.

- Reshape or replace sandbags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

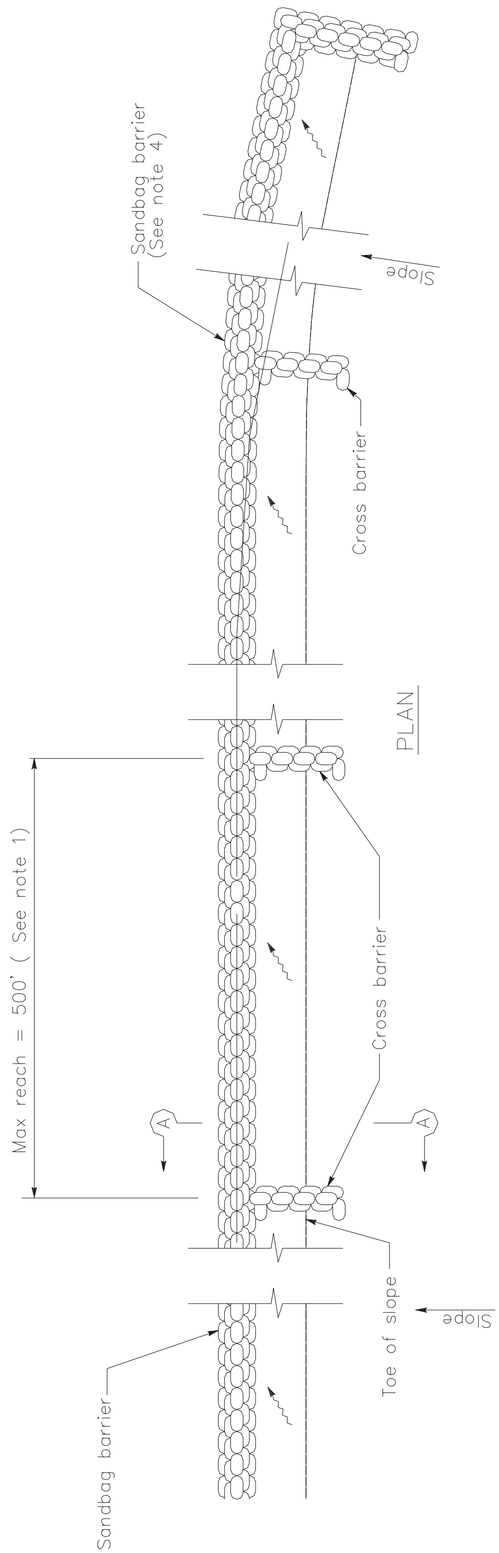
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

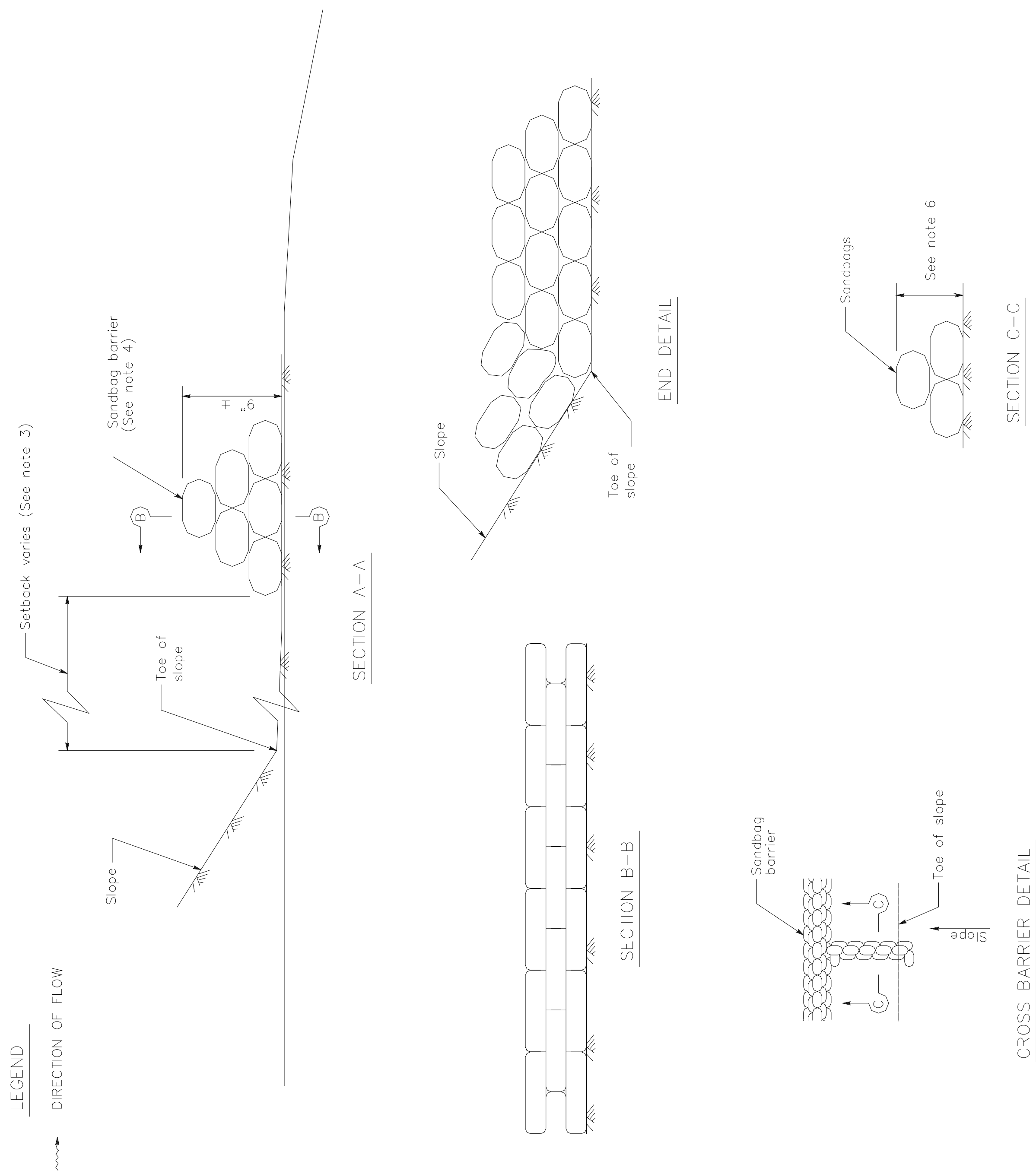
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



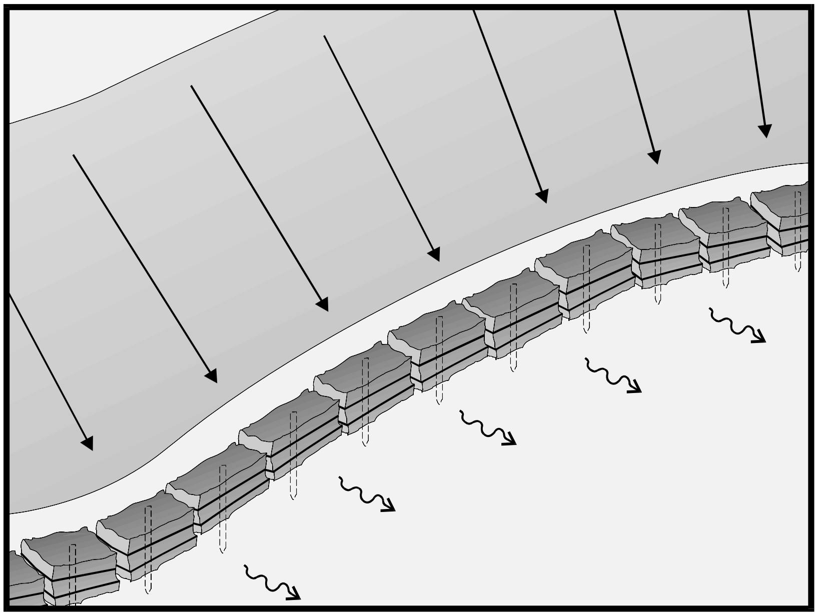
SANDBAG BARRIER

NOTES

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



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



Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

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

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

- At the top of slopes to divert runoff away from disturbed slopes

- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.

  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.

  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.

- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.

- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.

- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.

- Maximum flow path to the barrier should be limited to 100 ft.

- Straw bale barriers should consist of two parallel rows.

  - Butt ends of bales tightly

  - Stagger butt joints between front and back row

  - Each row of bales must be trenched in and firmly staked

- Straw bale barriers are limited in height to one bale laid on its side.

- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.

- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.

- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.

- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

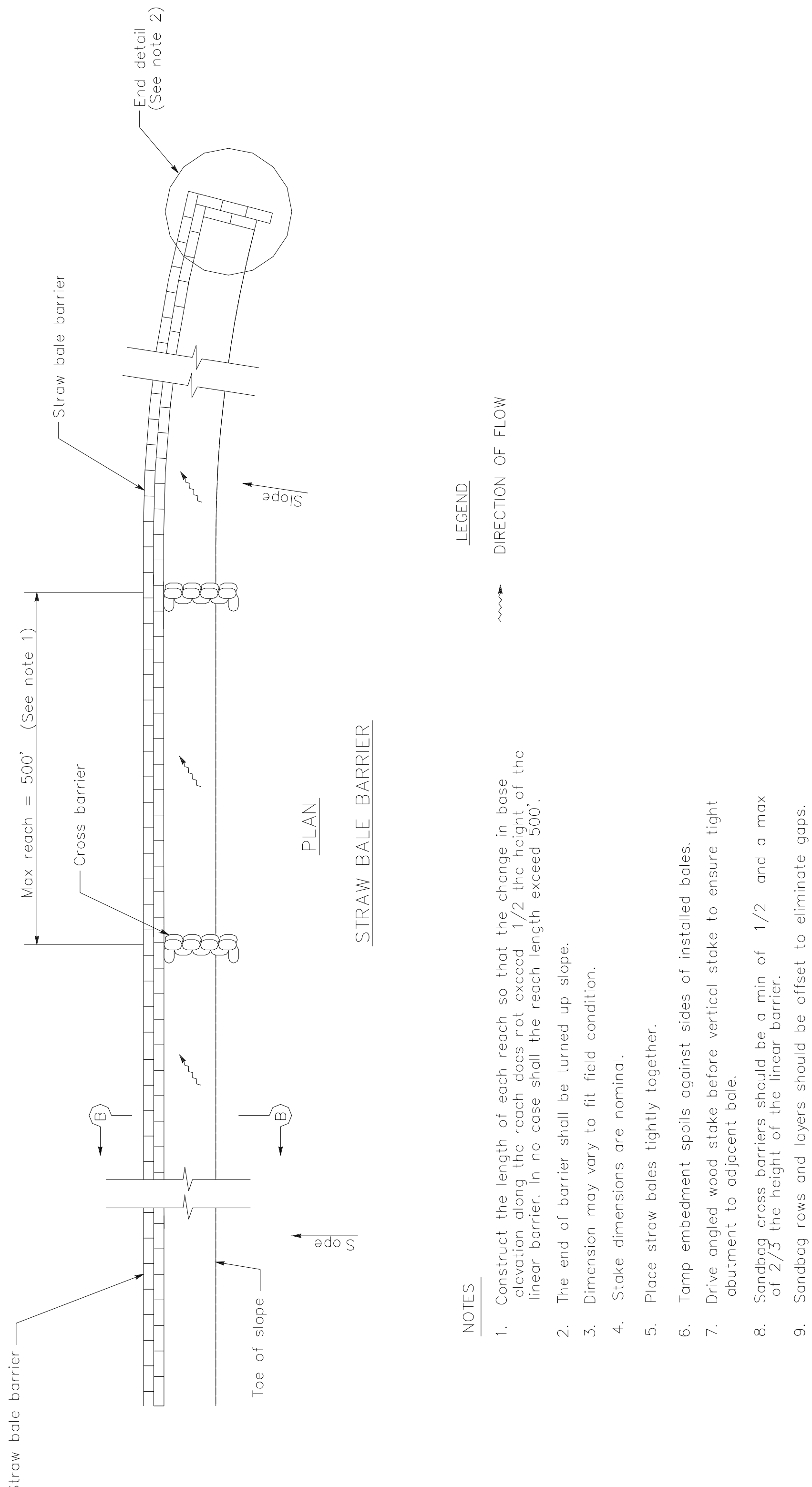
Inspection and Maintenance

Maintenance

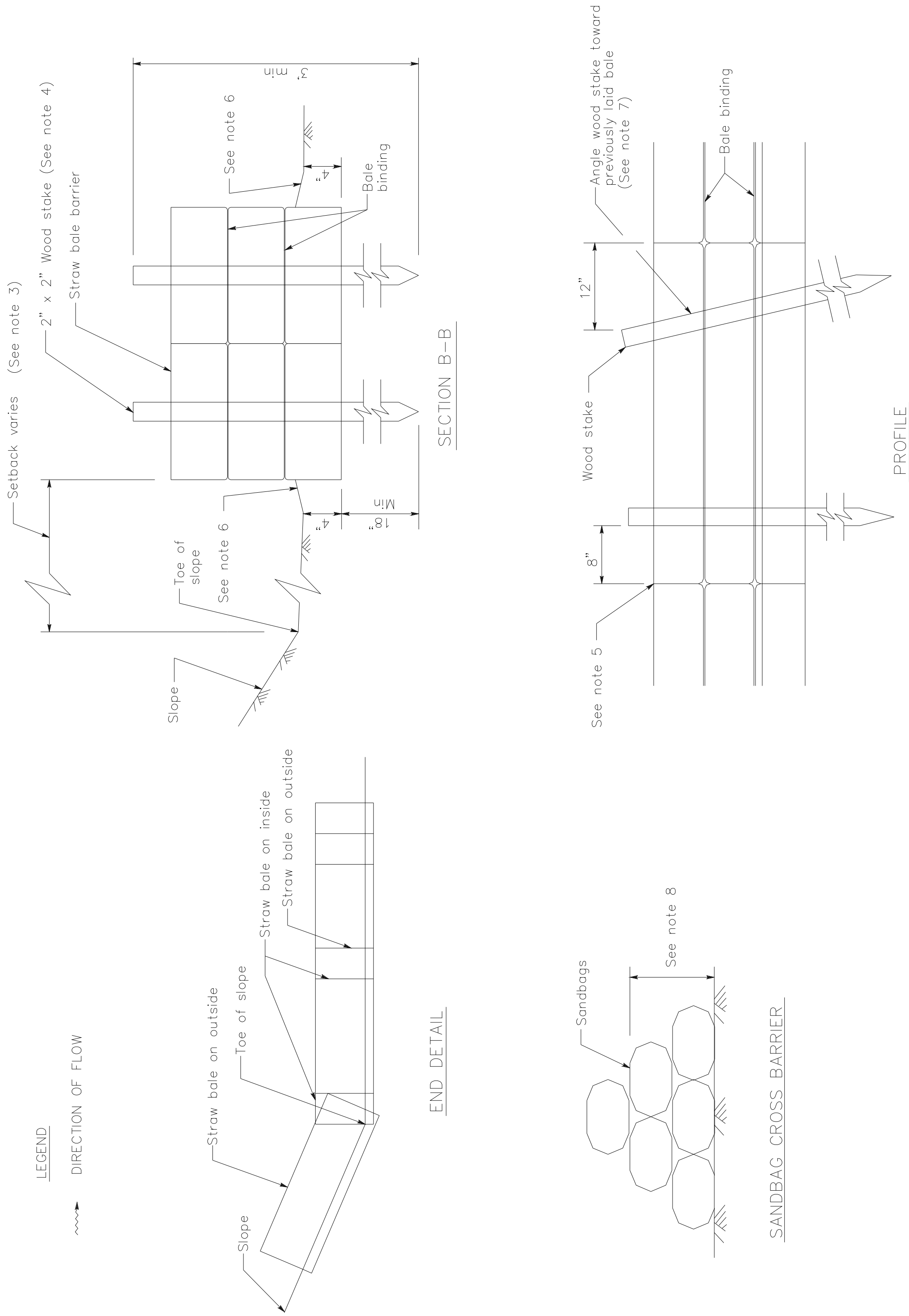
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

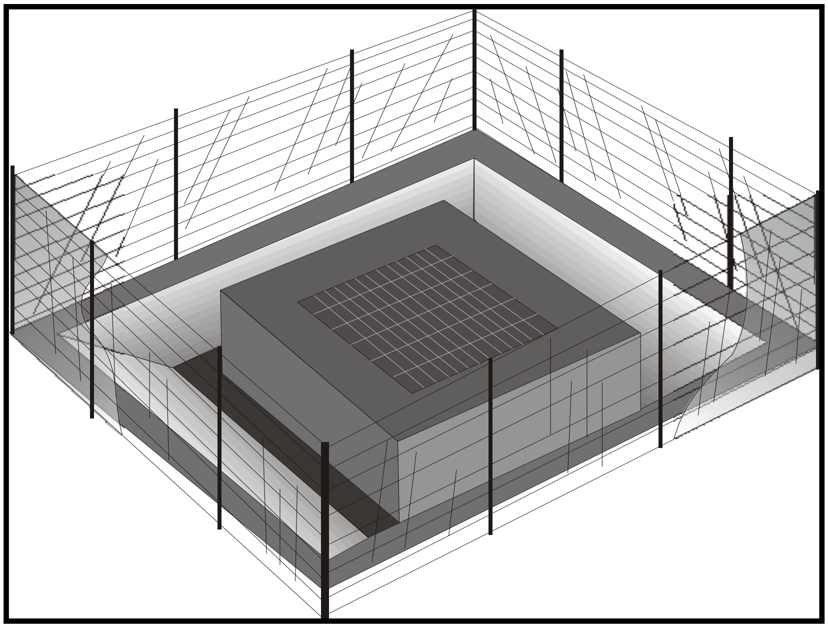
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



End detail
(See note 2)
Straw bale barrier
Slope
Max reach = 500' (See note 1)
Cross barrier
PLAN
STRAW BALE BARRIER
LEGEND
DIRECTION OF FLOW
B
B
Slope
Straw bale barrier
Toe of slope
NOTES
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.



Setback varies (See note 3)
2" x 2" Wood stake (See note 4)
Straw bale barrier
See note 6
3' min
4"
Bale binding
SECTION B-B
18" Min
Toe of slope
See note 6
Slope
Angle wood stake toward previously laid bale (See note 7)
Bale binding
12"
Wood stake
PROFILE
8"
See note 5
LEGEND
DIRECTION OF FLOW
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
See note 8
Sandbags
SANDBAG CROSS BARRIER



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

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

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.

- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.

- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.

  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.

  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.

- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.

  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).

  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.

  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.

  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.

  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.

- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.

- Provide area around the inlet for water to pond without flooding structures and property.

- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.

- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence -*** Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.

  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.

  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.

  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap -*** Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag -*** Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

1. Construct on gently sloping street.

2. Leave room upstream of barrier for water to pond and sediment to settle.

3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter -*** Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary) –*** Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

  1. Construct in a gently sloping area.
  2. Biofilter bags should be placed around inlets to intercept runoff flows.
  3. All bag joints should overlap by 6 in.
  4. Leave room upstream for water to pond and for sediment to settle out.
  5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.

- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.

- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.

- Remove storm drain inlet protection once the drainage area is stabilized.

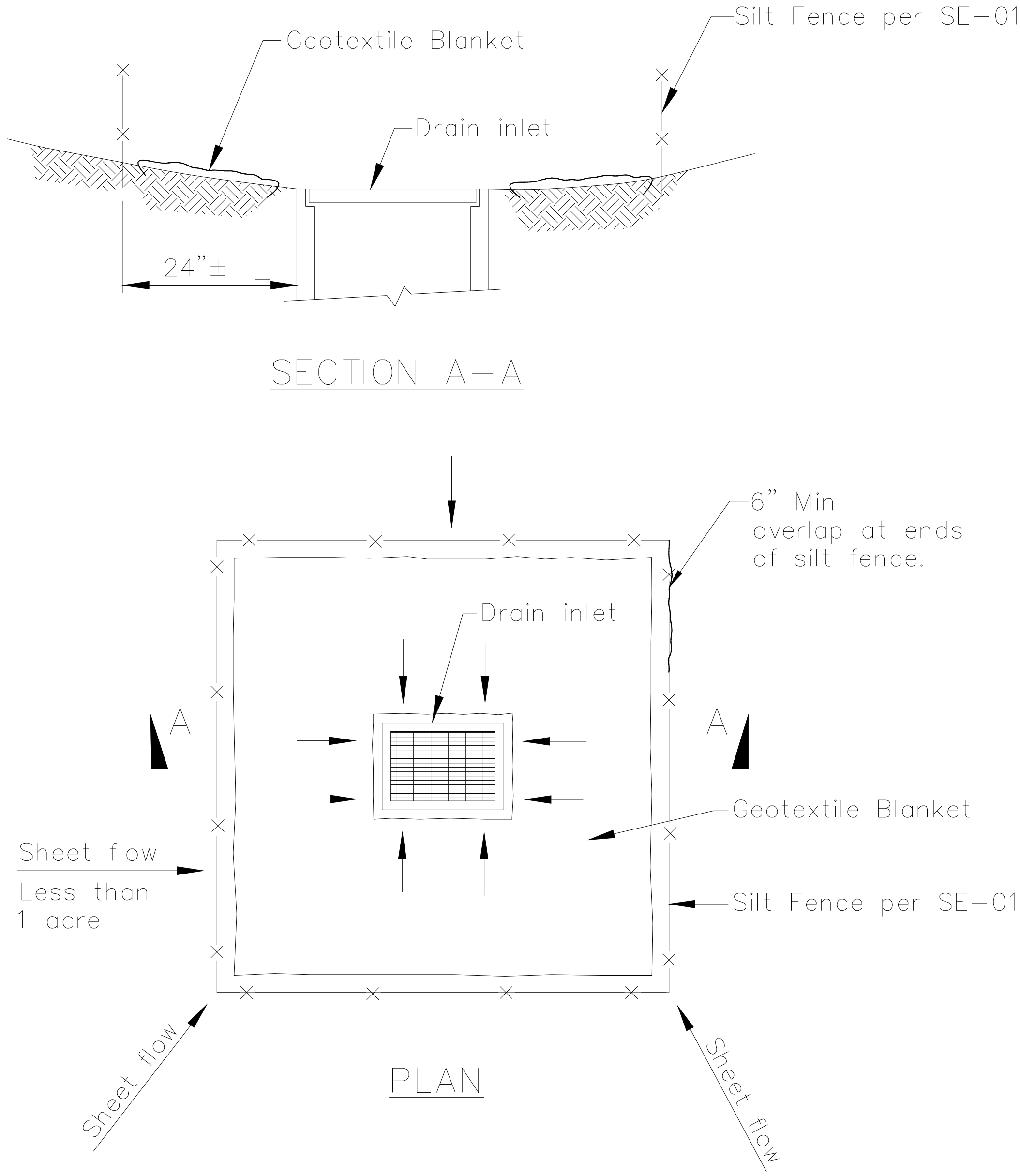
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

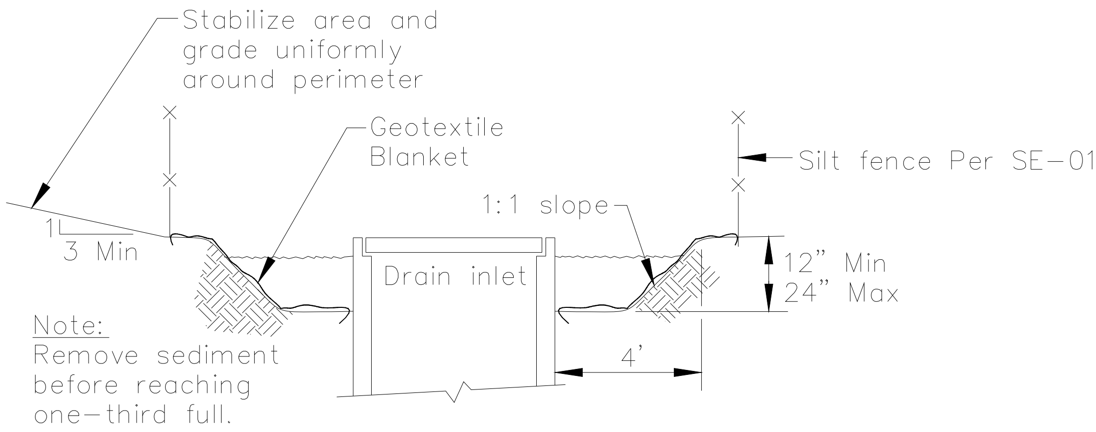
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



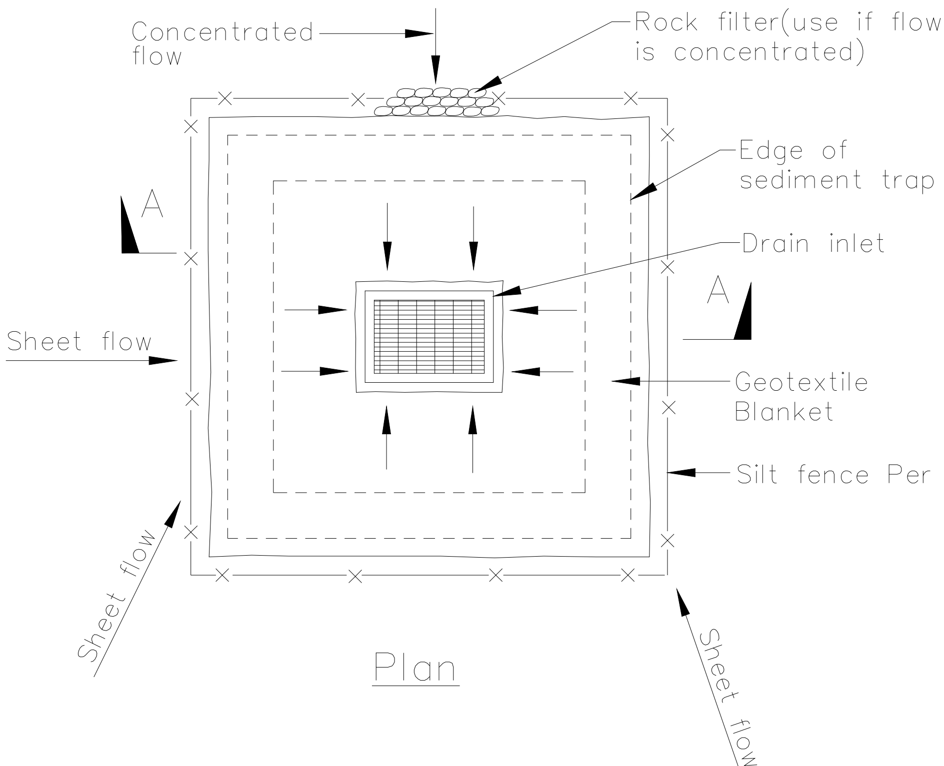
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



Section A-A

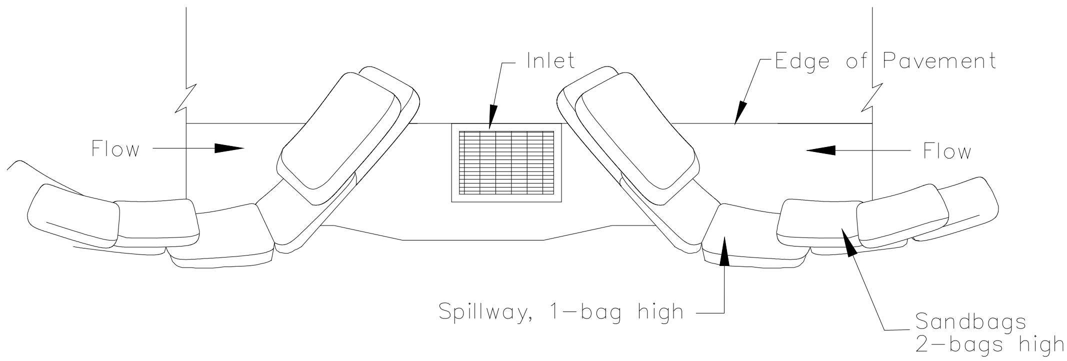


Plan

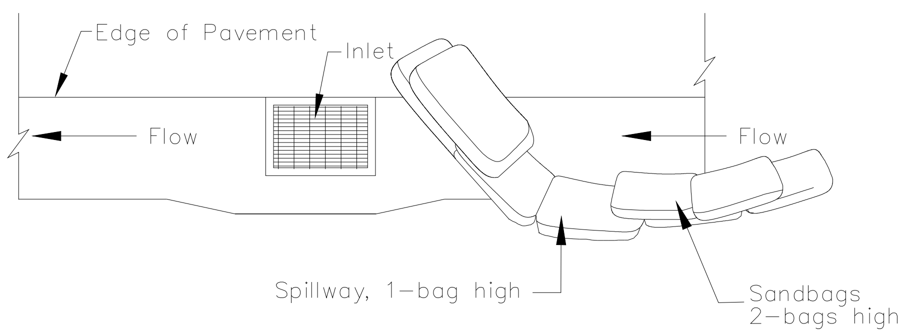
DI PROTECTION TYPE 2

NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



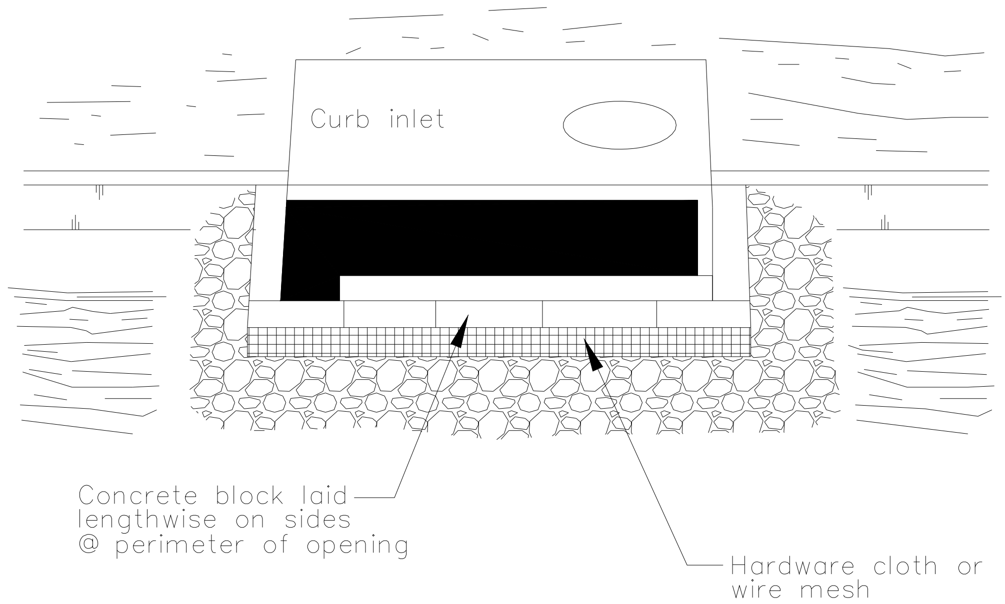
TYPICAL PROTECTION FOR INLET ON GRADE

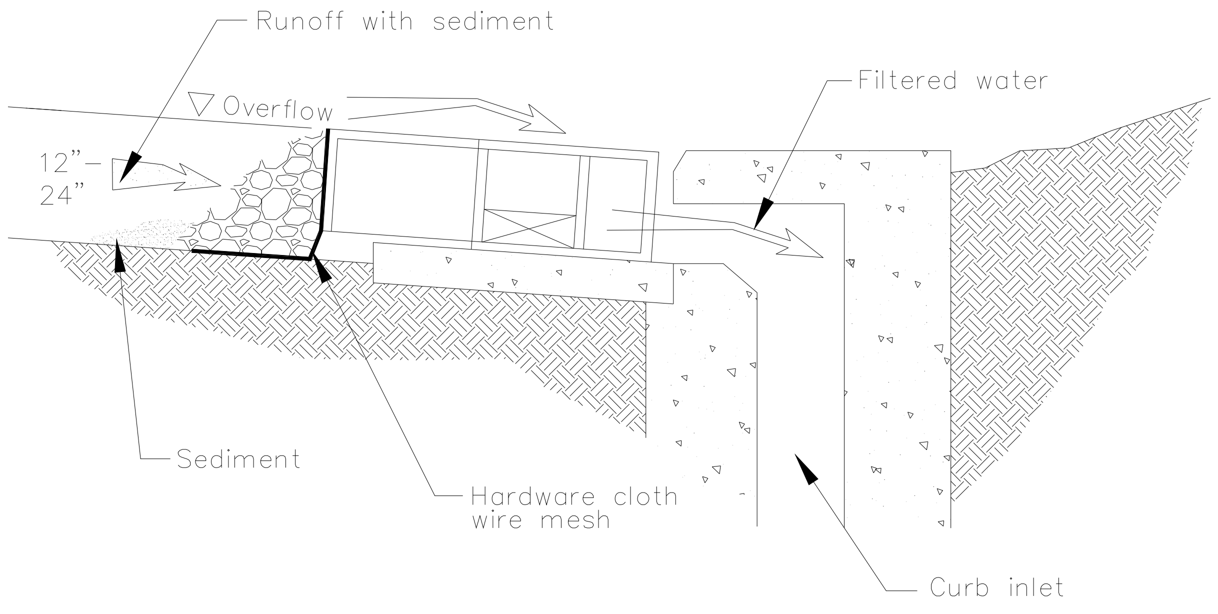
NOTES:

1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3

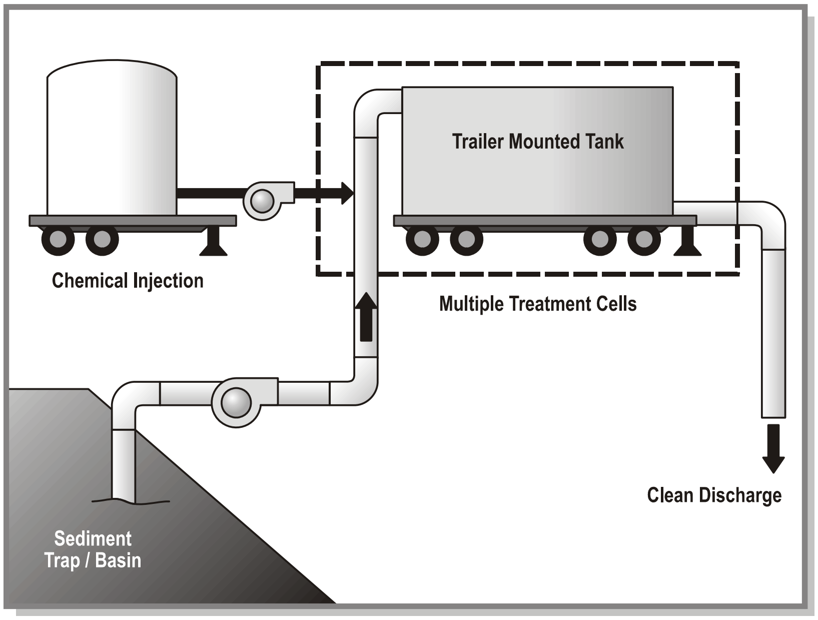
NOT TO SCALE





DI PROTECTION – TYPE 4

NOT TO SCALE



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Active Treatment Systems (ATS) reduce turbidity of construction site runoff by introducing chemicals to stormwater through direct dosing or an electrical current to enhance flocculation, coagulation, and settling of the suspended sediment. Coagulants and flocculants are used to enhance settling and removal of suspended sediments and generally include inorganic salts and polymers (USACE, 2001). The increased flocculation aids in sedimentation and ability to remove fine suspended sediments, thus reducing stormwater runoff turbidity and improving water quality.

Suitable Applications

ATS can reliably provide exceptional reductions of turbidity and associated pollutants and should be considered where turbid discharges to sediment and turbidity sensitive waters cannot be avoided using traditional BMPs. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

Limitations

Dischargers choosing to utilize chemical treatment in an ATS must follow all guidelines of the Construction General Permit Attachment F – Active Treatment System Requirements. General limitations are as follows:

- Numeric Effluent Limit (NEL) for all discharges (10 NTU daily flow-weighted average)
- Limited availability of chemical residual testing procedures that meet permit requirements for flow-through treatment
- Specific field and classroom ATS training required to operate equipment
- Batch treatment requires extensive toxicity testing of effluent
- Batch treatment requires large footprint to accommodate treatment cells
- Requires additional filtration to remove residual floc and treatment chemicals prior to discharge
- Petroleum based polymers should not be used
- Requires site-specific design and equipment
- Limited discharge rates depending on receiving water body
- Labor intensive operation and maintenance
- ATS costs are higher on a unit basis for smaller sites that would be expected to have a lower volume of treated runoff
- ATS costs are seasonably variable due to increases or decreases in rainfall volumes

Implementation

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). ATS may be used to reduce the turbidity of stormwater runoff. With an ATS, very high turbidities can be reduced to levels comparable to what is found in streams during dry weather.

Criteria for ATS Product Use

Chemically treated stormwater discharged from construction sites must be non-toxic to aquatic organisms. The following protocol should be used to evaluate chemicals proposed for stormwater treatment at construction sites. Authorization to use a chemical in the field based on this protocol does not relieve the applicant from responsibility for meeting all discharge and receiving water criteria applicable to a site.

- An ATS Plan, which includes an Operation and Maintenance component, a Monitoring, Sampling and Reporting component, a Health and Safety component, and a Spill Prevention component must be prepared and submitted to the Regional Water Quality Control Board (RWQCB).

- Treatment chemicals should be approved by EPA for potable water use or otherwise be demonstrated to be protective of human health and the environment. Chemical residual or whole effluent toxicity testing is required.

- Prior to field use of chemical treatment, jar tests are to be conducted to demonstrate that turbidity reduction necessary to meet the NELs and receiving water criteria can be achieved. Test conditions, including but not limited to raw water quality and jar test procedures, should be indicative of field conditions. Although these small-scale tests cannot be expected to reproduce performance under field conditions, they are indicative of treatment capability. A minimum of six site-specific jar tests must be conducted per chemical.

- The proposed maximum dosage should be at least a factor of five lower than the no observed effects concentration (NOEC).

- Effluent discharge from an ATS to a receiving water is conditional upon the favorable results of full-scale whole effluent bioassay/toxicity testing for batch treatment systems and upon chemical residuals testing for flow-through systems.

- Contact the RWQCB for a list of treatment chemicals that may be pre-approved for use.

Active Treatment System Design Considerations

The design and operation of an ATS should take into consideration the factors that determine optimum, cost-effective performance. While site characteristics will influence system design, it is important to recognize the following overriding considerations:

- The right chemical must be used at the right dosage. A dosage that is either too low or too high will not produce the lowest turbidity. There is an optimum dosage rate. This is a situation where the adage “adding more is always better” is not the case.

- The coagulant must be mixed rapidly into the water to insure proper dispersion.

- The mixing system for batch treatment must be sized to provide adequate mixing for the design storage volume. Lack of adequate mixing during the flocculation phase results in flocs that are too small and/or insufficiently dense. Too much mixing can rapidly destroy floc as it is formed.

- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. The discharge should be directed through a filtration system such as sand, bag, or cartridge filter that would catch any unintended floc discharge.

- ATS is also regulated for pH of the discharge. A pH-adjusting chemical should be added into the treated water to control pH if the selected coagulant requires alteration of the pH of the discharge outside of the acceptable range.

Active Treatment System Design

ATS can be designed as batch treatment systems using either ponds or portable trailer-mounted tanks, or as flow-through systems using any number of proprietary designed systems.

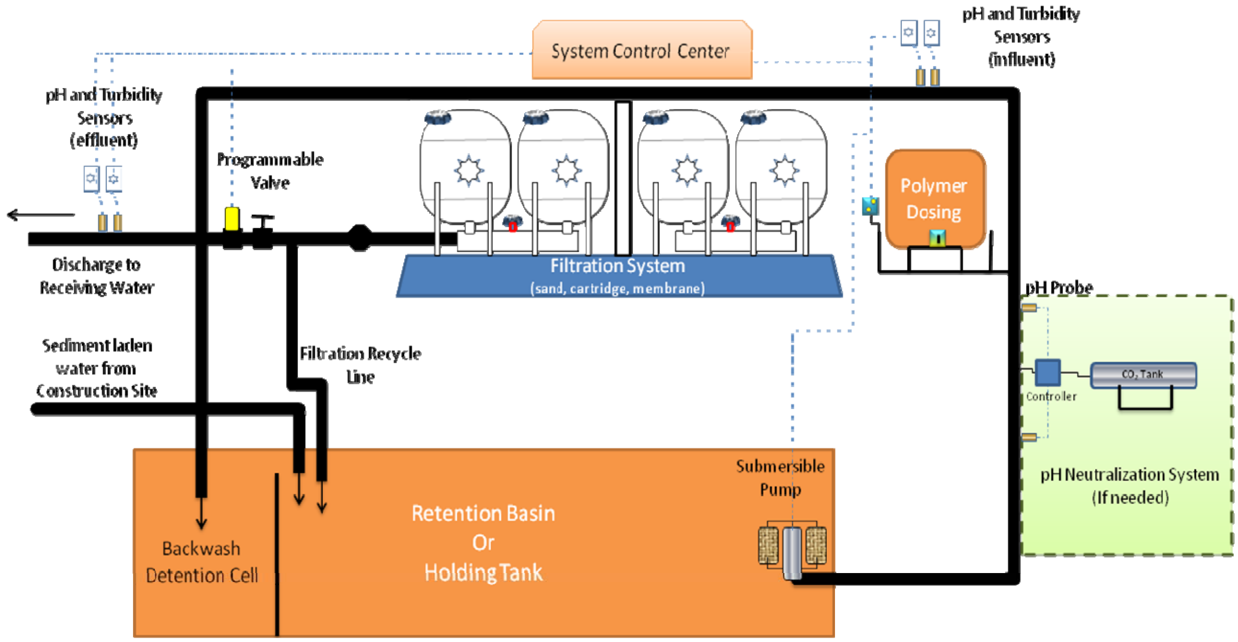


Figure has been adapted from Port of Seattle response to Washington Dept. of Ecology Action Order 2948

Batch Treatment

Batch Treatment systems consist of the stormwater collection system (either temporary diversion or the permanent site drainage system); a sediment basin, trap or holding tanks; pumps; a chemical feed system; treatment cells; and, interconnecting piping.

Batch treatment systems should use a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be basins, traps, or tanks. Portable tanks may also be suitable for some sites.

The following equipment should be located in a secured, covered location:

- The chemical injector
- Secondary contaminant for acid, caustic, buffering compound, and treatment chemical
- Emergency shower and eyewash
- Monitoring equipment which consists of a pH meter and a turbidimeter (if not already within the instrumentation panel of the chemical injector)

Flow-through Treatment

At a minimum, a flow-through ATS system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), an untreated stormwater storage pond or holding tank, and a chemically enhanced filtration system.

Stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area.

The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced filtration system where polymer is added. Adjustments to pH may be necessary before chemical addition. The filtration system continually monitors the stormwater for turbidity and pH. If the discharge water is out of the acceptable turbidity or pH range, the water is recycled to the untreated stormwater pond (or holding tank) where it can be retreated. Flow through systems must ensure that:

- Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days of continuous data.
- Instrumentation systems are interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.
- Upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.
- The instrumentation system provides a method for controlling coagulant dose, to prevent potential overdosing.

Sizing Criteria

An ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

ATS must be designed to capture and treat (within 72 hours) runoff from the 10-year 24-hour storm event. The runoff volume of the watershed area to be treated from this size storm event is required to be calculated using the Rational Method with a runoff coefficient of 1.

If sediment basins are used to capture flow-through or batch treatment, see SE-2, Sediment Basin, for design criteria. Bypass should be provided around the ATS to accommodate extreme storm events. Primary settling should be encouraged in the sediment basin/storage pond. A forebay with access for maintenance may be beneficial.

The permissible discharge rate governed by potential downstream effect should be used to calculate the recommended size of the treatment cells. Local requirements related to Phase I or Phase II NPDES permit thresholds should be considered in developing maximum discharge rates the ATS Plan.

Costs

Costs for ATS may be significant due to equipment rental requirements and cost of chemicals. ATS cost is lower on a treated unit-basis for large construction sites with large volumes of runoff.

Inspection and Maintenance

ATS must be operated and maintained by individuals with experience in their use and trained in accordance with training requirements below. ATS should be monitored continuously while in use. A designated responsible person shall be on site daily at all times during treatment operations. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log. The name, phone number, and training documentation of the person responsible for system operation and monitoring shall be included in the project data log.

The following monitoring requirements and results should be recorded in the data log:

Operational and Compliance Monitoring

- Effluent flow rate and volume shall be continuously monitored and recorded at 15- minute or less intervals.
- Influent and effluent pH must be continuously monitored and recorded at 15-minute or less intervals.
- Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at 15-minute or less intervals.
- The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.
- Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.
- Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.
- Effluent shall be monitored and recorded for residual chemical/additive levels.
- If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

Toxicity Monitoring

Batch Treatment

Toxicity testing for systems operated in batch treatment mode should be made in accordance with the following:

- Acute toxicity testing on effluent samples representing effluent from each batch prior to discharge shall be undertaken. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.
- Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas*. Rainbow trout, *Oncorhynchus mykiss,* may be used as a substitute for fathead minnow.

All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

Flow-through Treatment

Toxicity testing for systems operated in flow-through treatment mode should be made in accordance with the following:

- A residual chemical test method shall be used that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used. The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant.
- The residual chemical test method shall produce a result within one hour of sampling.
- A California State certified laboratory shall validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

Numeric Effluent Limit (NEL) Compliance:

All chemically treated stormwater must be sampled and tested for compliance with pH and turbidity limits. These limits have been established by the Construction General Permit. Sampling and testing for other pollutants may also be necessary at some sites. Turbidity limits have been set as 10 NTU as a daily flow-weighted average or 20 NTU from a single sample. pH must be within the range of 6.0 to 9.0 standard units. It is often possible to discharge treated stormwater that has a lower turbidity than the receiving water and that matches the pH.

Treated stormwater samples and measurements should be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water should not be taken from the treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

Operator Training:

Operators shall have training specific to using an ATS and liquid coagulants for stormwater discharges in California. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal. Training shall include a minimum of eight hours classroom and 32 hours field training.

Standard BMPs:

Erosion and sediment control BMPs should be implemented throughout the site to prevent erosion and discharge of sediment to the ATS. Some types of chemical coagulation and flocculation are only achievable in water below a certain turbidity; therefore minimizing the amount of sediment reaching the system will increase the likelihood of meeting effluent limits and will potentially lower costs of chemical dosing.

Sediment Removal and Disposal

- Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.
- Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.
- If sediment is determined to be non-toxic, it may be incorporated into the site away from drainages.

References

Engineering and Design – Precipitation/Coagulation/Flocculation. United States Army Corps of Engineers, EM 1110-1-4012, 2001.

Evaluation of Active Treatment Systems (ATS) for Construction Site Runoff. California Building and Industry Association (prepared by Geosyntec Consultants), 2008.

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

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

Temporary Silt Dike

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

Temporary silt dikes are pre-manufactured devices that are typically specified and installed for semi-permanent drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels.

Suitable Applications

Temporary silt dikes are generally used in areas as a substitute for fiber rolls and silt fences to slow down runoff water, divert drainage or contain fines and sediment. A temporary silt dike typically consists of a triangular foam or recycled rubber core covered in geotextile fabric. Temporary silt dikes are a linear control and have a variety of profiles (triangular, round, and square). Temporary silt dikes may be suitable for:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.
- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles or material/equipment storage areas.
- At the interface between graveled driveways and pavement.
- Along the toe of exposed and erodible slopes.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

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Limitations

- Temporary silt dikes require additional measures to adhere to asphalt in cold and windy climates, as glue may not adhere adequately to the pavement.
- Temporary silt dikes may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the barrier, possibly causing flooding or bypass if sufficient space does not exist to accommodate ponding.
- Temporary silt dikes may require frequent maintenance especially when used near vehicle traffic or to detain concentrated flows (e.g. check dams or inlet protection).
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

When appropriately placed, temporary silt dikes intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The core is porous, which allows the ponded runoff to flow slowly through the silt dike, releasing the runoff as sheet flows. Generally, temporary silt dikes should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control or as a non-stormwater perimeter control.

Design and Layout

- Temporary silt dikes used on soil should be attached to the ground per manufacturer specifications.
- Temporary silt dikes used on asphalt or concrete may be attached using a variety of methods, including nailing the dikes to the pavement, or using a high strength adhesive.
- Follow manufacturer specifications when installing temporary silt dikes.
- Allow sufficient space up slope from the silt dikes to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, temporary silt dike should be set back three feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the silt dike may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Butt ends of temporary silt dike tightly. Overlaps should be sealed in accordance with the manufacturer's detail.

Materials

- Several manufactured products are available.

Costs

- Silt dike averages $35-45 per 7 ft. section.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Temporary silt dike exposed to sunlight will need to be replaced more frequently due to photo-degradation.
- Reshape or replace sections of damaged temporary silt dike as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove temporary silt dikes when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Categories

EC	Erosion Control	☒
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control. The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)

- Along the perimeter of a project

- As check dams in unlined ditches (compost socks only)

- Down-slope of exposed soil areas

- At operational storm drains as a form of inlet protection (compost socks only)

- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).

- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.

- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.

- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.

- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

Implementation

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminates.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.

- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.

- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon

Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8” to 18”, but are typically 12” to 18” in diameter.

- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.

- Locate compost socks and berms on level contours spaced as follows:

  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.

- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.

- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.

- Use additional anchoring and erosion control BMPS in conjunction of the compost socks and berms as needed.

- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.

- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.

- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

Costs

Recently obtained vendor costs indicated $3.50 per linear foot for compost berm application and $2.00 per linear foot for 8" socks and $2.50 per linear foot for 12"socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.

- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

References

An analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2001.

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National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-4 Check Dams

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

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Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" X 18" and 30" X 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

  - Along streams and channels

- As linear erosion control measure:

  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

  - At the top of slopes to divert runoff away from disturbed slopes

  - As check dams across mildly sloped construction roads

- Inlet Protection (See SE-10)

- Supplement to silt fences or other sediment control devices

Limitations

- Short life-span (2-3 months); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.

- Easily damaged by construction vehicles.

- If not properly staked, will fail on slope applications.

- If improperly installed can allow undercutting or side-cutting flow.

- Not effective where water velocities or volumes are high.

- Potentially buoyant and easily displaced if not properly installed.

Implementation

General

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

Design and Layout – Linear control

- Locate biofilter bags on level contours.

  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.

  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.

  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.

- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.

- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.

  - Drive one stake at each end of the bag.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- Biofilter bags should be overlapped (6 in.), not abutted.

Costs
Pre-filled biofilter bags cost approximately $2.50-$3.50 per bag, dependent upon size.

Inspection and Maintenance
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace biofilter bags as needed.

- Repair washouts or other damage as needed.

- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

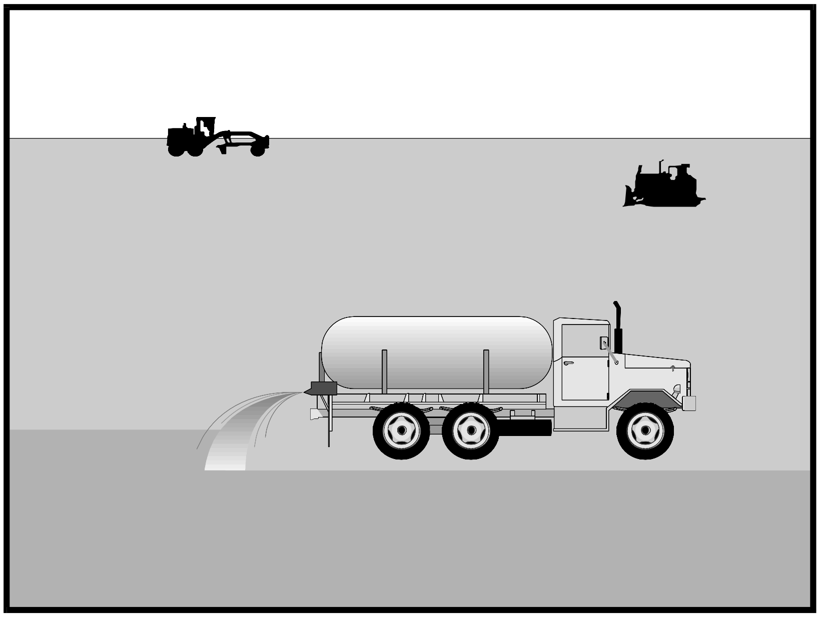
- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

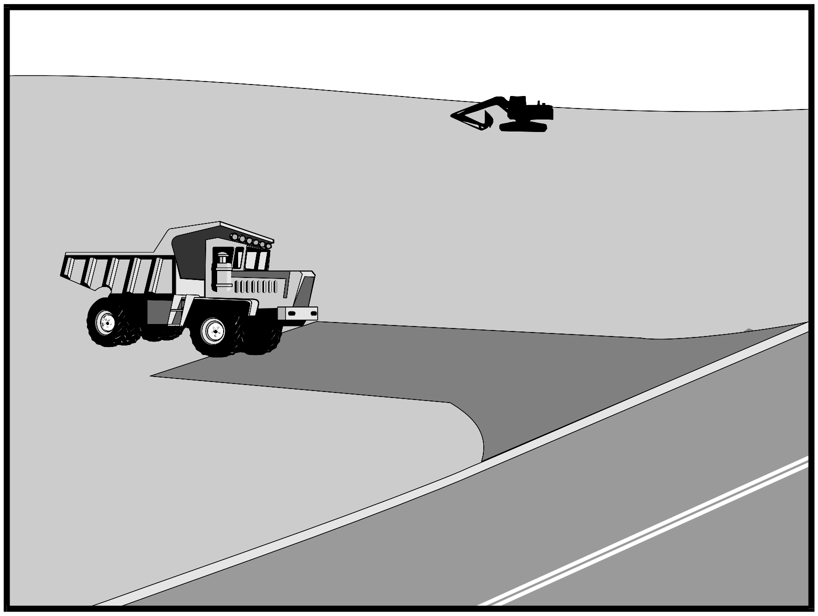
Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water

runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

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

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

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

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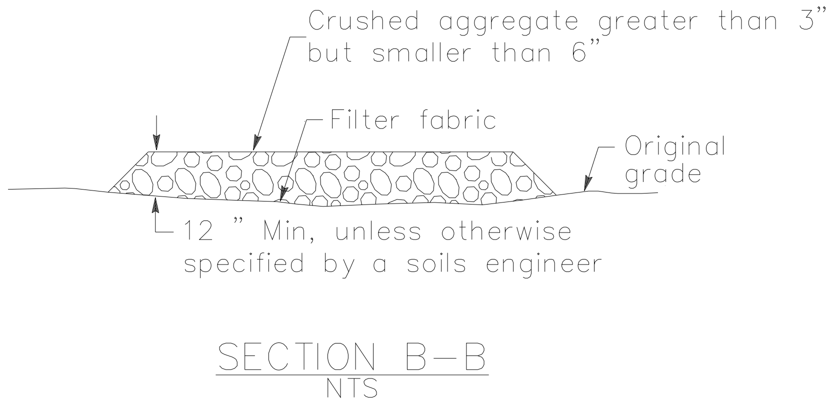
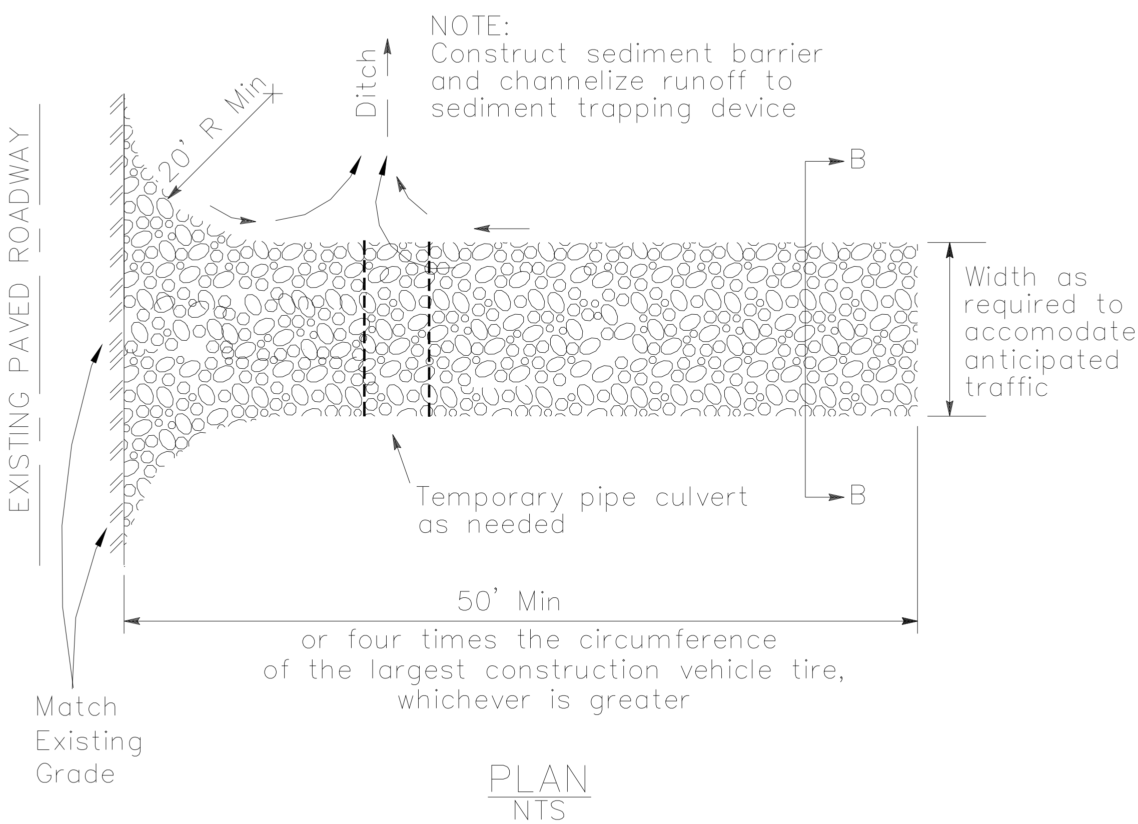
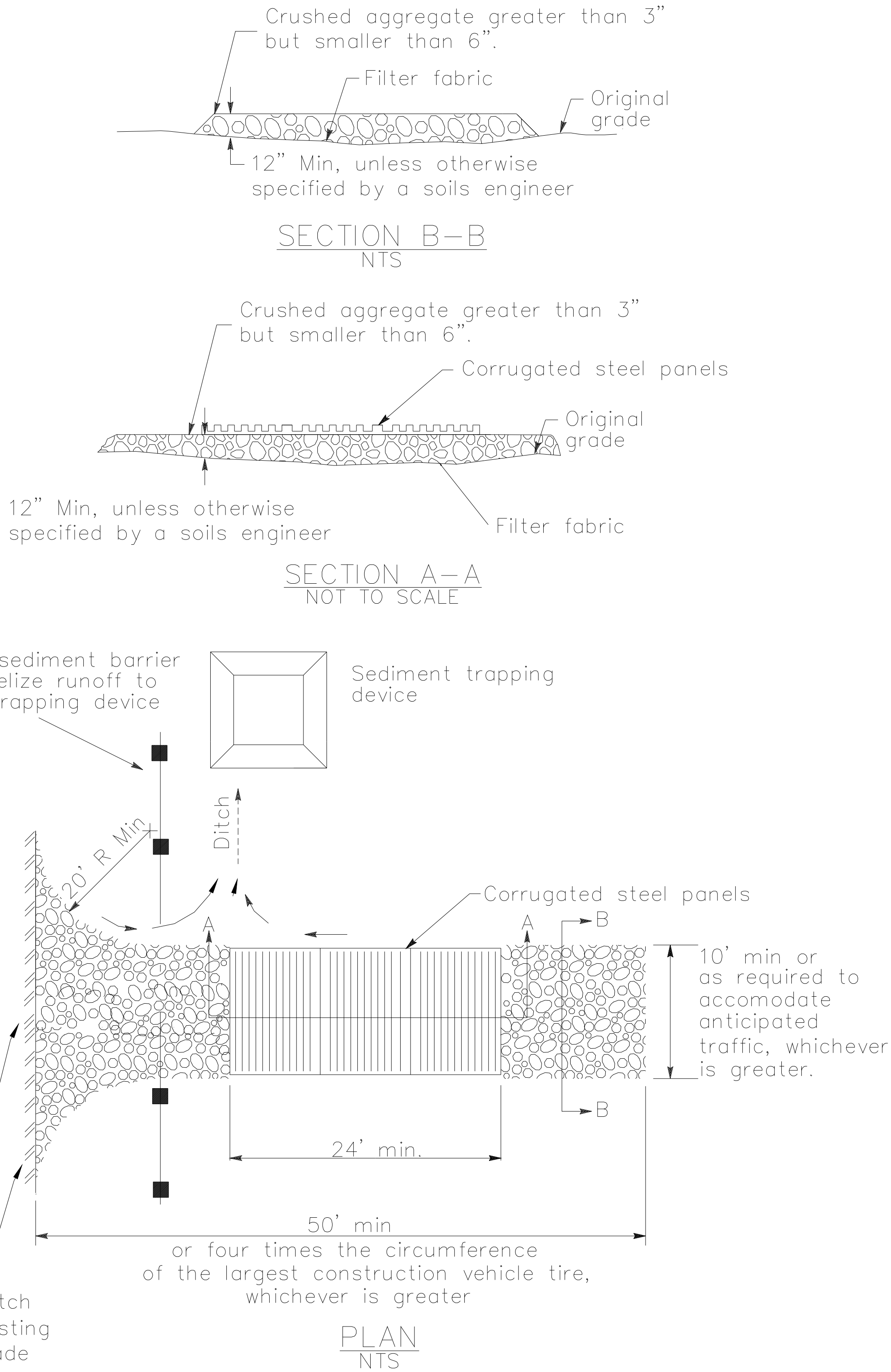
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

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

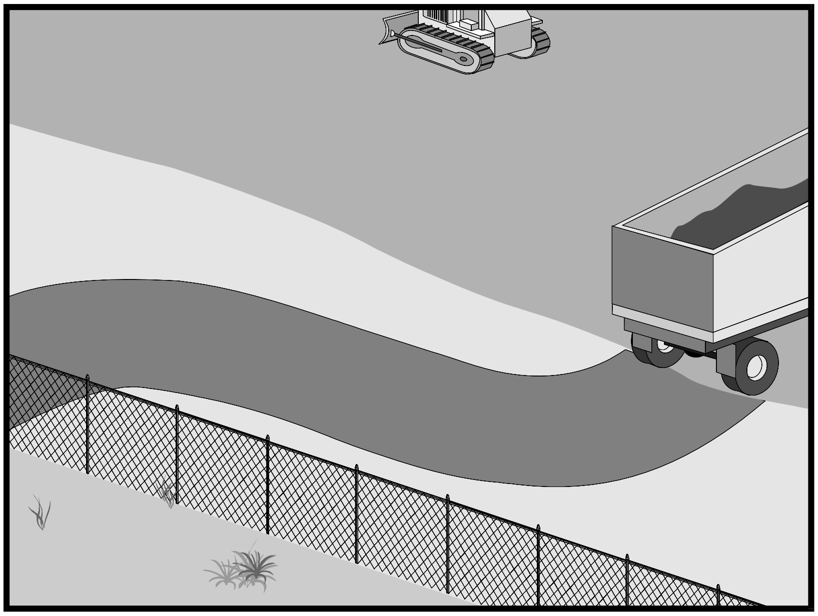

Crushed aggregate greater than 3" but smaller than 6"
Filter fabric
Original grade
12 " Min, unless otherwise specified by a soils engineer
SECTION B-B
NTS


NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
B
B
Width as required to accomodate anticipated traffic
Temporary pipe culvert as needed
50' Min
or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS



Crushed aggregate greater than 3" but smaller than 6".
Filter fabric
Original grade
12" Min, unless otherwise specified by a soils engineer
SECTION B-B
NTS
Crushed aggregate greater than 3" but smaller than 6".
Corrugated steel panels
Original grade
12" Min, unless otherwise specified by a soils engineer
Filter fabric
SECTION A-A
NOT TO SCALE
NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
Corrugated steel panels
A
A
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater.
24' min.
50' min
or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS

Stabilized Construction Roadway TC-2



Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.

- Coordinate materials with those used for stabilized construction entrance/exit points.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, impact weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Keep all temporary roadway ditches clear.

- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

- Periodically apply additional aggregate on gravel roads.

- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

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

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

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

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

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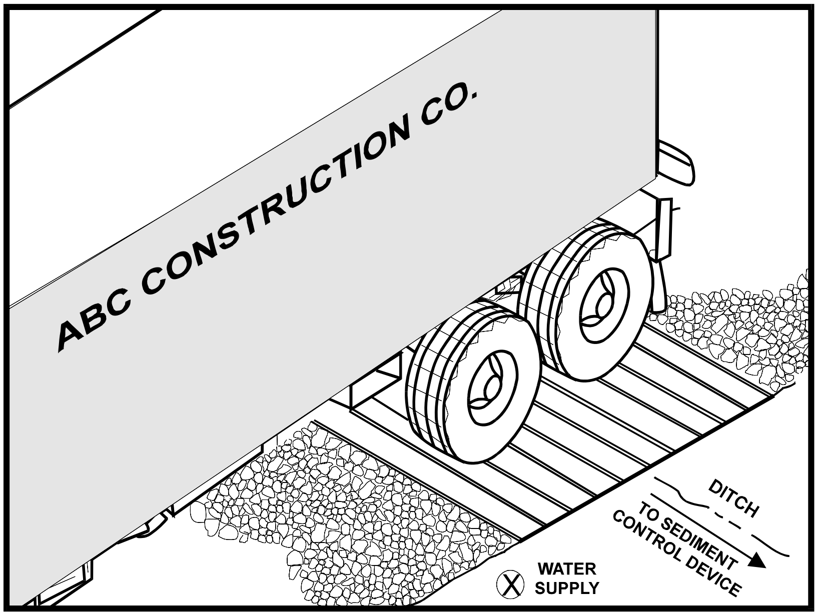
Entrance/Outlet Tire Wash — TC-3



Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

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- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.

- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.

- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.

- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.

- Inspect routinely for damage and repair as needed.

References

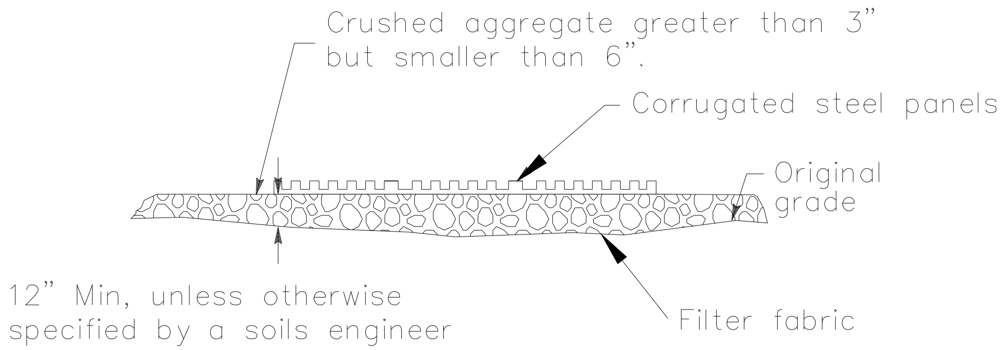
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

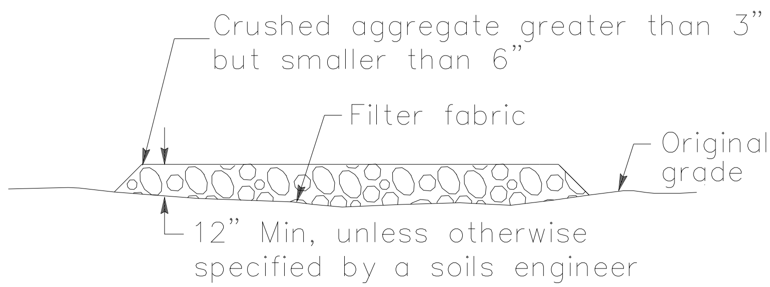
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

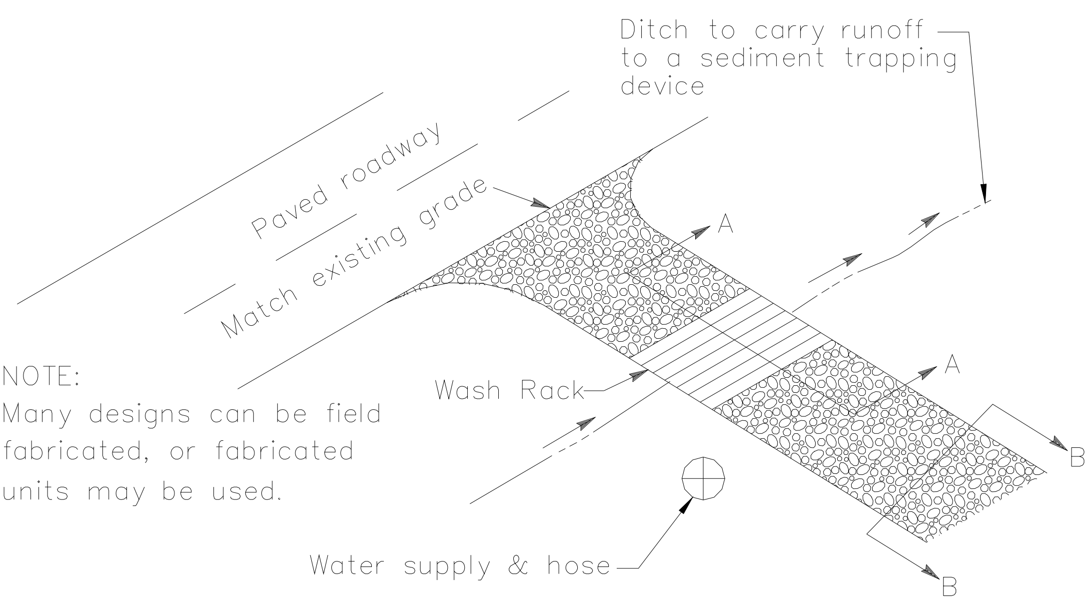
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



SECTION A–A
NOT TO SCALE



SECTION B–B
NTS



NOTE:
Many designs can be field fabricated, or fabricated units may be used.

TYPICAL TIRE WASH
NOT TO SCALE

Section 4
Non-Stormwater Management and Material Management BMPs

4.1 Non-Stormwater Management BMPs

The discharge of materials other than stormwater and authorized non-stormwater discharges is prohibited by NPDES regulations as well as other local codes and ordinances. It is recognized that certain authorized non-stormwater discharges may be necessary for the completion of construction projects. Such discharges include but are not limited to irrigation of vegetative erosion control measures, and pipe flushing and testing.

Non-stormwater management BMPs are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source or eliminating off-site discharge. These practices involve day-to-day operations of the construction site and are usually under the control of the contractor. These BMPs are also referred to as "good housekeeping practices" which involve keeping a clean, orderly construction site.

Non-stormwater management BMPs also include procedures and practices designed to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning, fueling, and maintenance operations to stormwater drainage systems or to watercourses.

Table 4-1 Non-Stormwater Management BMPs

BMP#	BMP Name
NS-1	Water Conservation Practices
NS-2	Dewatering Operations[1]
NS-3	Paving and Grinding Operations[1]
NS-4	Temporary Stream Crossing
NS-5	Clear Water Diversion
NS-6	Illicit Connection/Discharge
NS-7	Potable Water/Irrigation
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle and Equipment Fueling
NS-10	Vehicle and Equipment Maintenance
NS-11	Pile Driving Operations
NS-12	Concrete Curing[1]
NS-13	Concrete Finishing[1]
NS-14	Material and Equipment Use
NS-15	Demolition Adjacent to Water
NS-16	Temporary Batch Plants[1]
1) BMP fact sheet updated in 2009	

Table 4-1 lists the non-stormwater management BMPs. All these BMPs must be implemented depending on the conditions and applicability of deployment described as part of the BMP. The key to implementing these BMPs is to maintain a clean site and keep water, runoff, and run-on away from potential pollutants, including bare soil. In general, conduct construction activities so that: potential pollutants are not discharged directly to drainage systems; generation of potential pollutants is limited; and pollutants that are generated are contained and cleaned up immediately and are therefore not available for later discharge. These BMPs are fundamental to water quality protection and all sites must implement non-stormwater BMPs appropriate for the construction activities being performed.

It is recommended that owners and contractors be vigilant regarding implementation of these BMPs, including making their implementation a condition of continued employment, and part of all prime and subcontract agreements. By doing so, the chance of inadvertent violation by an uncaring individual can be prevented, potentially saving thousands of dollars in fines and project delays. Also, if procedures are not properly implemented and/or if BMPs are compromised then the discharge may be subject to additional sampling and analysis requirements for non-visible pollutants contained in the General Permit. (See section 2.5.5 of this handbook.)

4.2 Waste Management & Materials Pollution Control BMPs

Waste management and materials pollution control BMPs, like non-stormwater management BMPs, are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater. These BMPs also involve day-to-day operations of the construction site, and are under the control of the contractor, and are additional "good housekeeping practices" which involve keeping a clean, orderly construction site. These BMPs are fundamental to water quality protection and all sites must implement waste management and/or materials pollution control non-stormwater BMPs appropriate for the construction activities being performed.

Table 4-2 Waste Management & Materials Pollution Control BMPs

BMP#	BMP Name
WM-1	Material Delivery and Storage[1]
WM-2	Material Use[1]
WM-3	Stockpile Management[1]
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management[1]
WM-9	Sanitary/ Septic Waste Management[1]
WM-10	Liquid Waste Management[1]
1) BMP fact sheet updated in 2009	

Waste management consists of implementing procedural and structural BMPs for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into stormwater runoff or discharges through proper management of the following types of wastes:

- Solid
- Sanitary
- Concrete
- Hazardous
- Equipment-related wastes

Materials pollution control (also called materials handling) consists of implementing procedural and structural BMPs in the handling of, storing, and the using of construction materials. The BMPs are intended to prevent the release of pollutants during stormwater and non-stormwater discharges. The objective is to prevent or reduce the opportunity for contamination of stormwater runoff from construction materials by covering and/or providing secondary containment of storage areas and/or by taking adequate precautions when handling materials.

These controls must be implemented for all applicable activities, material usage, and site conditions. The discharge of construction materials or wastes from a site is prohibited.

Table 4-2 lists the waste management and materials pollution control BMPs. It is important to note that these BMPs should be implemented depending on the conditions/applicability of deployment described as part of the BMP.

4.3 Fact Sheet Format

A BMP fact sheet is a short document that presents detailed information about a particular BMP. Typically each fact sheet contains the information outlined in Figure 4-1. Completed fact sheets for each of the above activities are provided in Section 4.4.

The fact sheets also contain side bar presentations with information on BMP categories, targeted constituents, removal effectiveness, and potential alternatives.

NS-xx Example Fact Sheet

Description and Purpose

Suitable Applications

Limitations

Implementation

Costs

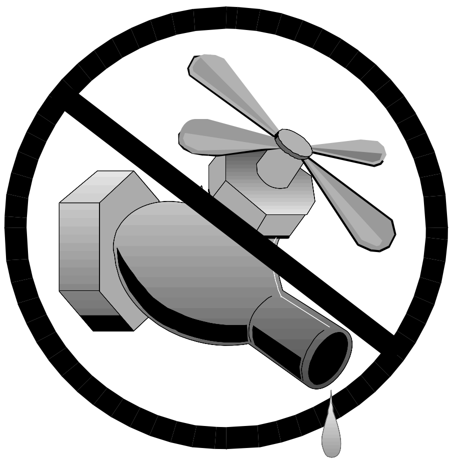
Inspection and Maintenance

References

Figure 4-1
Example Fact Sheet

4.4 BMP Fact Sheets

BMP Fact Sheets for non-stormwater management and waste management and materials pollution control follow. The BMP fact sheets are individually page numbered and are suitable for inclusions in SWPPPs. Copies of the fact sheets can be individually downloaded from the CASQA BMP Handbook website at http://www.casqa.org.



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

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into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.

- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance

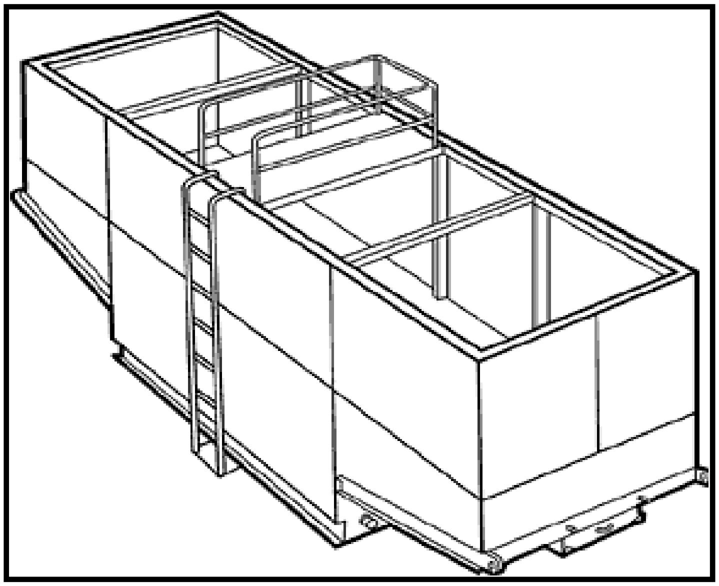
- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.

- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

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



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedences of the General Permit requirements.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required by the discharger. For example, when discharging to a water of the U.S., a groundwater extraction permit will be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained through the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.

- Temporary sediment basins should be fenced if safety is a concern.

- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.

- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.

- Trap inlets should be located to maximize the travel distance to the trap outlet.

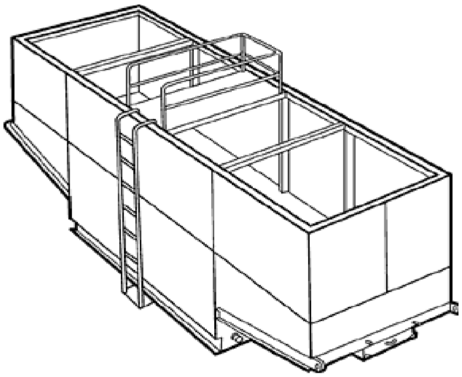
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.

- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks

Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.

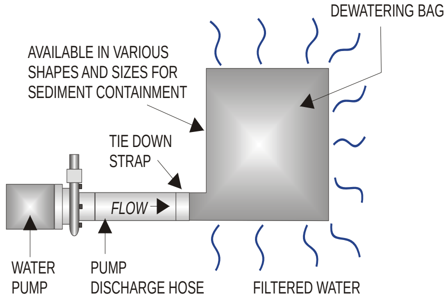
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.

- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter

Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.

- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.

- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.

- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.

- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter

Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter

Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.

- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

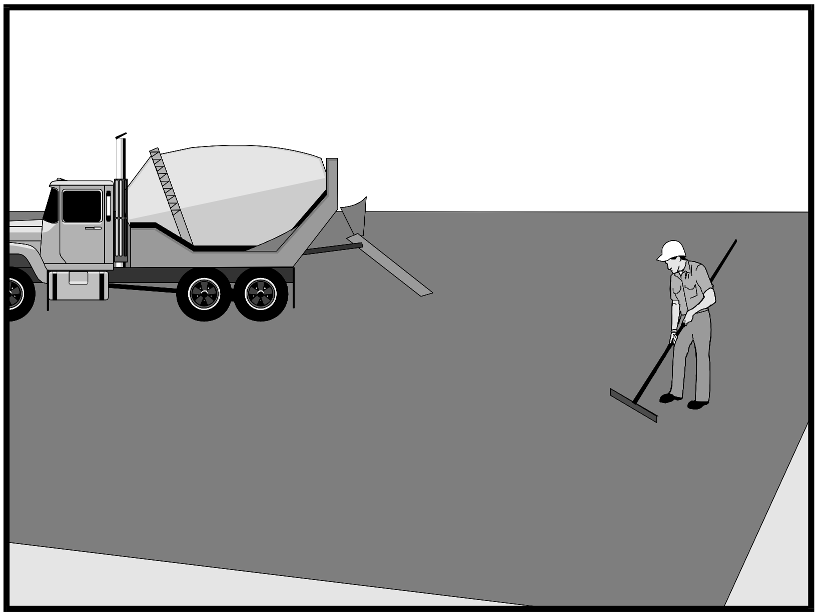
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

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

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

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

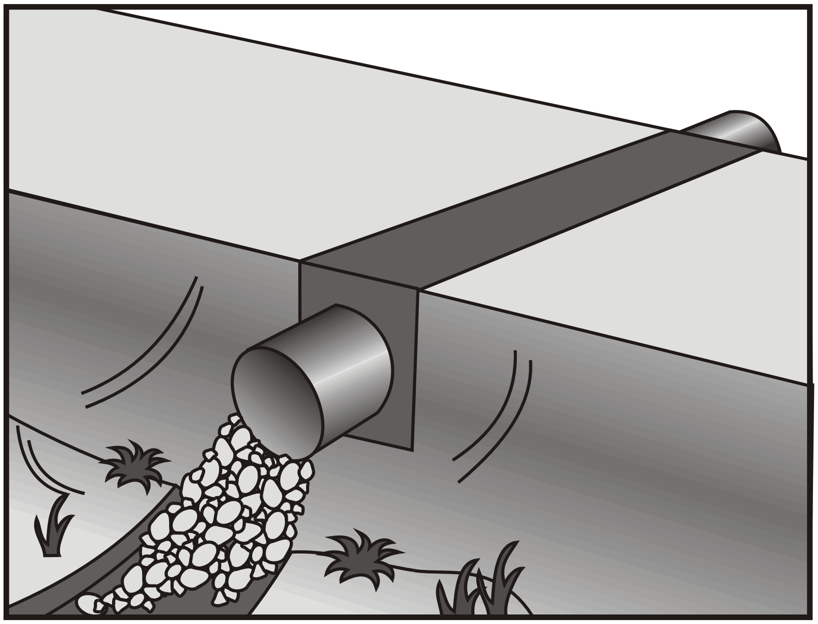
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Temporary Stream Crossing NS-4



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A temporary stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to maintain traffic for the public. The temporary access will eliminate erosion and downstream sedimentation caused by vehicles.

Suitable Applications

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels that may be significantly eroded by construction traffic.

Temporary streams crossings are installed at sites:

- Where appropriate permits have been secured (404 Permits, and 401 Certifications)
- Where construction equipment or vehicles need to frequently cross a waterway
- When alternate access routes impose significant constraints
- When crossing perennial streams or waterways causes significant erosion
- Where construction activities will not last longer than one year
- Where appropriate permits have been obtained for the

stream crossing

Limitations

The following limitations may apply:

- Installation and removal will usually disturb the waterway.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Installation may require dewatering or temporary diversion of the stream. See NS-2, Dewatering Operations and NS-5, Clear Water Diversion.
- Installation may cause a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- May be expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

Implementation

General

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light–duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Location of the temporary stream crossing should address:

- Site selection where erosion potential is low.

- Areas where the side slopes from site runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings should be considered:

- **Culverts** – A temporary culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.

- **Fords** - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams, and low-flow perennial streams. CCS, a type of ford crossing, is also appropriate for use in streams that would benefit from an influx of gravels. A temporary ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry ice season and in arid areas of California.

- **Bridges** - Appropriate for streams with high flow velocities, steep gradients and where temporary restrictions in the channel are not allowed.

Design

During the long summer construction season in much of California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.

Design and installation requires knowledge of stream flows and soil strength. Designs should be prepared under direction of, and approved by, a registered civil engineer and for bridges, a registered structural engineer. Both hydraulic and construction loading requirements should be considered with the following:

- Comply with any special requirements for culvert and bridge crossings, particularly if the temporary stream crossing will remain through the rainy season.

- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor should be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.

- Install sediment traps immediately downstream of crossings to capture sediments. See SE-3, Sediment Trap.

- Avoid oil or other potentially hazardous materials for surface treatment.

- Culverts are relatively easy to construct and able to support heavy equipment loads.

- Fords are the least expensive of the crossings, with maximum load limits.

- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.

- CCS allow designers to use either angular or naturally occurring rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.

- A gravel depth of 6 to 12 in. for a CCS structure is sufficient to support most construction equipment.

- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.

- Bridges are generally more expensive to design and construct, but provide the least disturbance of the streambed and constriction of the waterway flows.

Construction and Use

- Stabilize construction roadways, adjacent work area, and stream bottom against erosion.

- Construct during dry periods to minimize stream disturbance and reduce costs.

- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.

- Install temporary erosion control BMPs in accordance with erosion control BMP fact sheets to minimize erosion of embankment into flow lines.

- Any temporary artificial obstruction placed within flowing water should only be built from material, such as clean gravel or sandbags, that will not introduce sediment or silt into the watercourse.

- Temporary water body crossings and encroachments should be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments should be clean, rounded river cobble.

- Vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed.

- The exterior of vehicles and equipment that will encroach on the water body within the project should be maintained free of grease, oil, fuel, and residues.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate soil stabilization measures.

- Riparian vegetation, when removed pursuant to the provisions of the work, should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble must be removed upon completion of project activities.

- Conceptual temporary stream crossings are shown in the attached figures.

Costs

Caltrans Construction Cost index for temporary bridge crossings is \$45-\$95/ft^2.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two week intervals in the non-rainy season to verify continued BMP implementation.

- Check for blockage in the channel, sediment buildup or trapped debris in culverts, blockage behind fords or under bridges

- Check for erosion of abutments, channel scour, riprap displacement, or piping in the soil

- Check for structural weakening of the temporary crossings, such as cracks, and undermining of foundations and abutments

- Remove sediment that collects behind fords, in culverts, and under bridges periodically

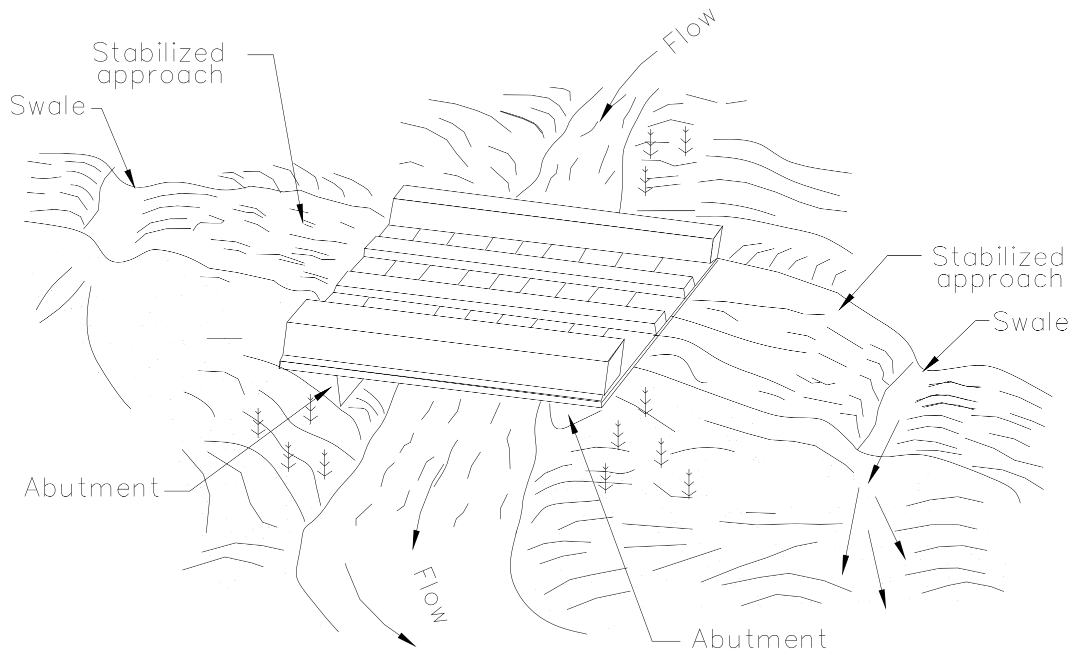
- Replace lost or displaced aggregate from inlets and outlets of culverts and cellular confinement systems

- Remove temporary crossing promptly when it is no longer needed

References

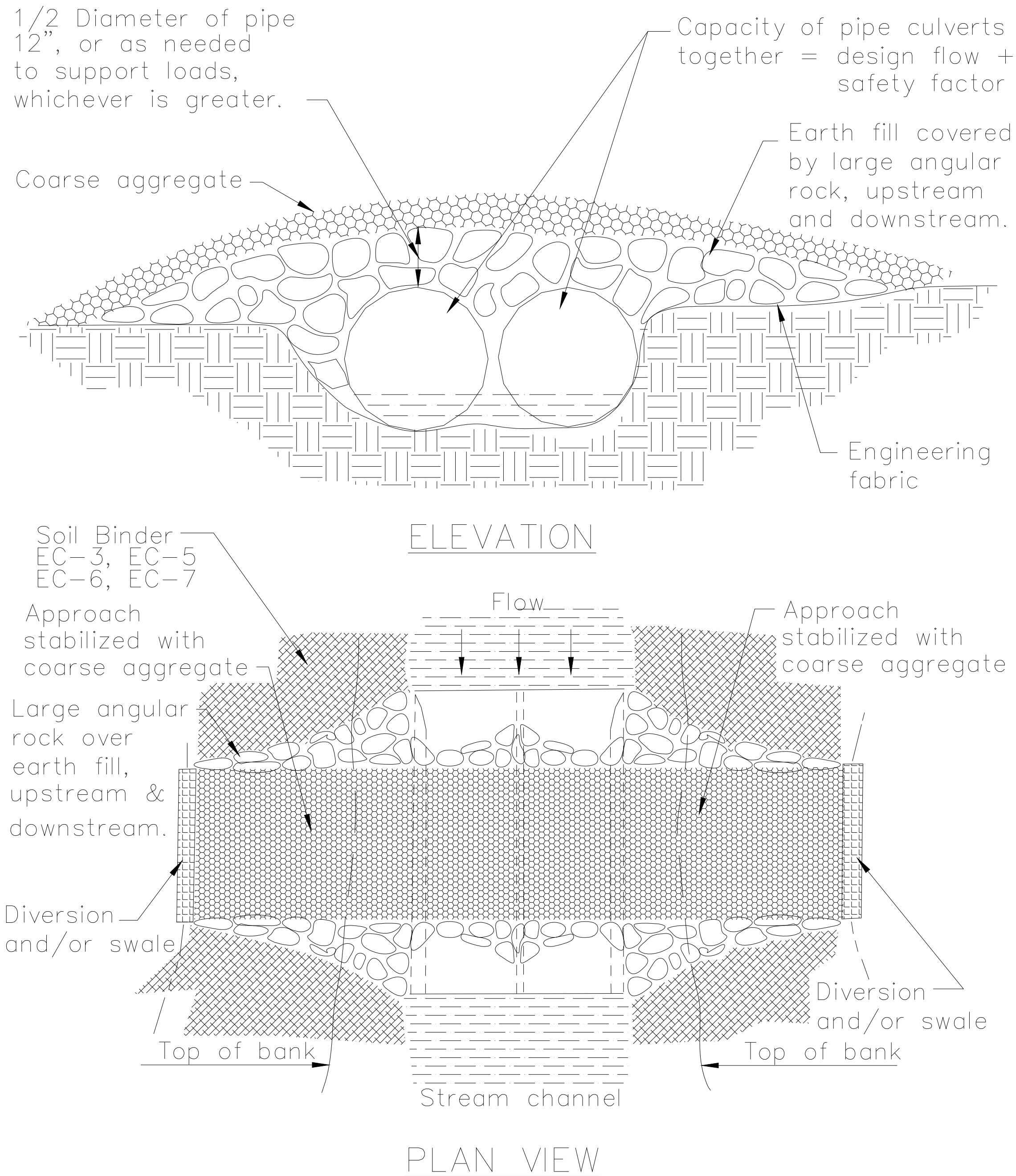
California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October 2000.

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

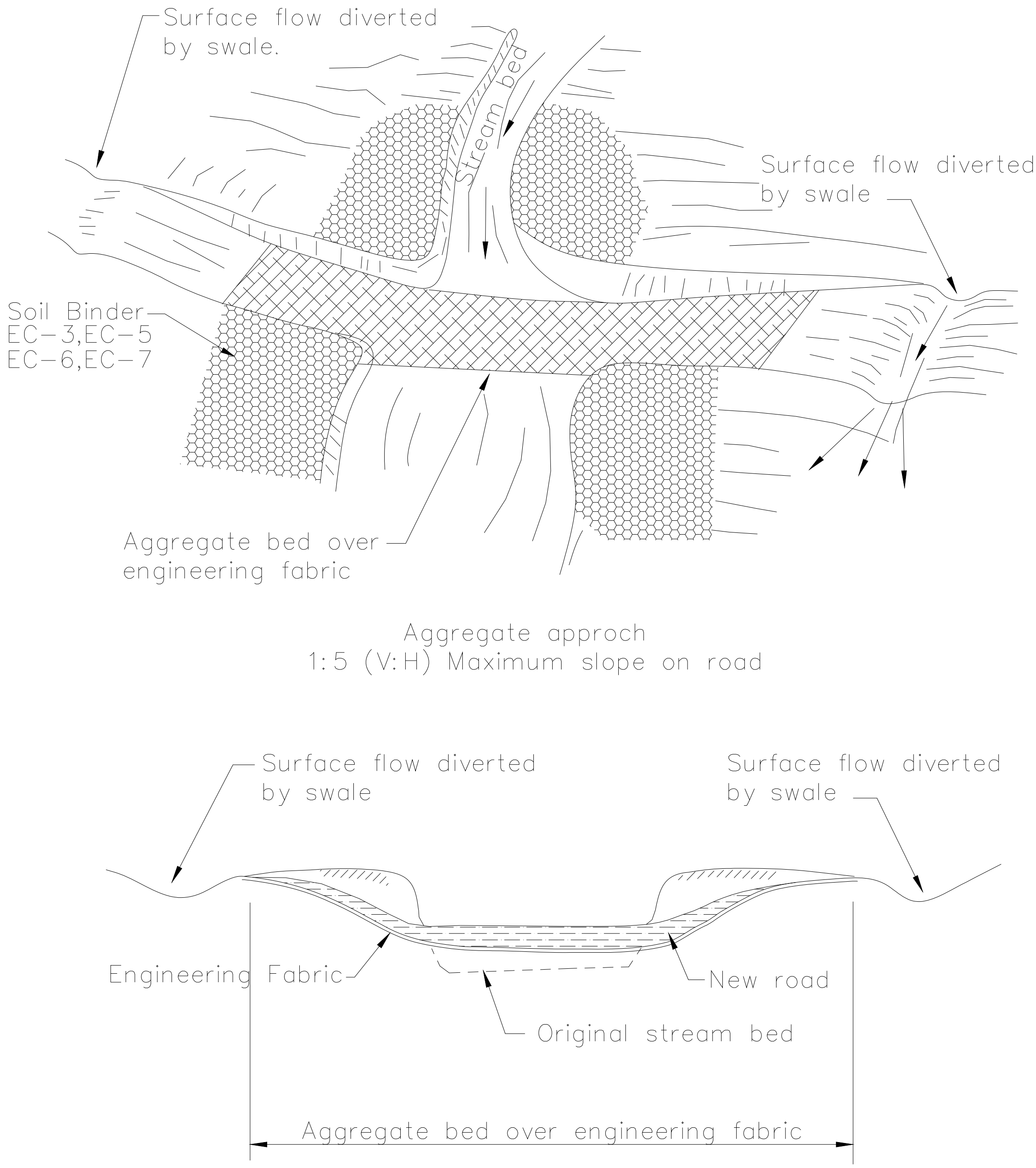


NOTE:
Surface flow of road diverted by swale and/or dike.

TYPICAL BRIDGE CROSSING
NOT TO SCALE

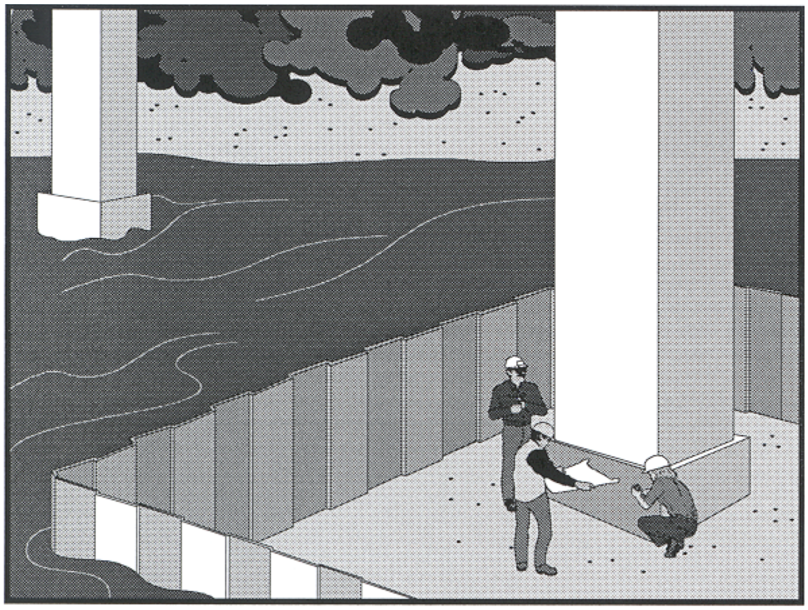


TYPICAL CULVERT CROSSING
NOT TO SCALE



TYPICAL FORD CROSSING

NOT TO SCALE



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.

- Pumped diversions are suitable for intermittent and low flow streams.

- Excavation of a temporary bypass channel, or passing the flow through a heavy pipe (called a "flume") with a trench excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in NS-17, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.

- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.

- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.

- Equipment should not be parked below the high water mark unless allowed by a permit.

- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.

- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.

- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.

- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.

- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to ‘key-in’ the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer’s specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.

- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.

- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.

- Remove and properly dispose of sediment buildup.

- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.

- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.

- Turbidity curtains should not be placed across the width of a channel.

- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.

- The curtain should extend the entire depth of the watercourse in calm-water situations.

- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.

- The curtain should be held in place by anchors placed at least every 100 ft.

- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.

- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.

- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.

- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.

- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

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

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Limitations

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

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.

- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.

- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.

- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.

- Dewatering of the work area is possible.

- Pipes can be moved around to allow construction operations.

- The dams can serve as temporary access to the site.

- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.

- A pumped diversion requires 24 hour monitoring of pumps.

- Sudden rain could overtop dams.

- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

Inspection and Maintenance

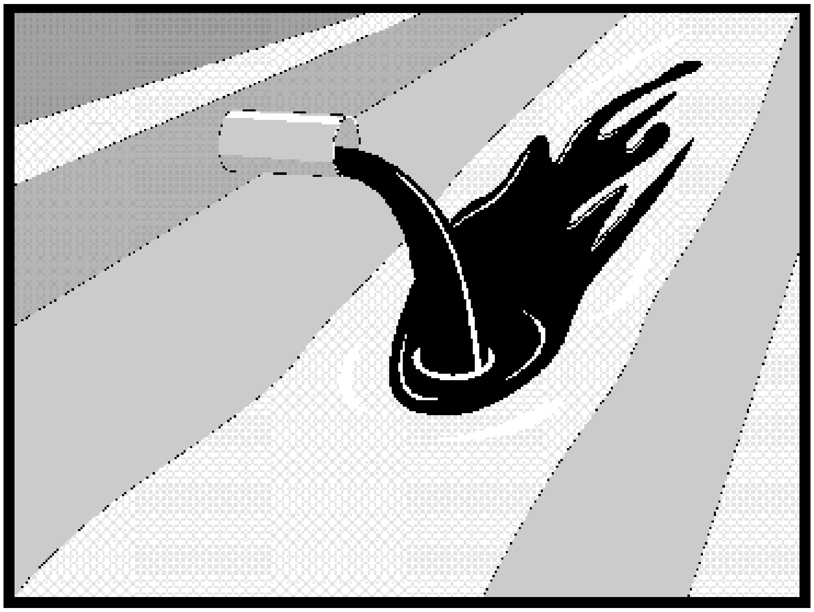
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

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

Illicit Connection / Discharge NS-6



Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.
- Inspect site regularly during project execution for evidence

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.

- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

- **Liquids** - signs of illegal liquid dumping or discharge can include:

  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season

- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects

- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect the site regularly to check for any illegal dumping or discharge.

- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.

- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

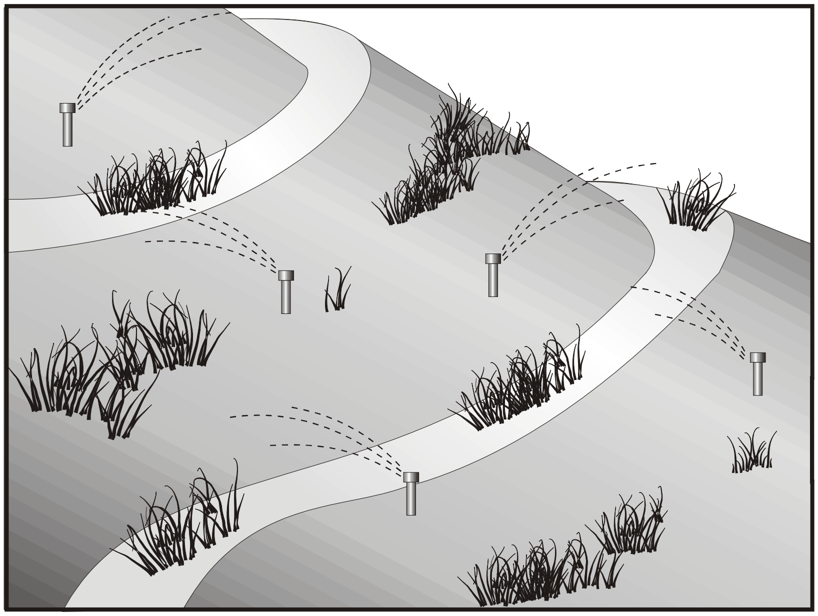
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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

Potable Water/Irrigation NS-7



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for

excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

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

- Repair broken water lines as soon as possible.

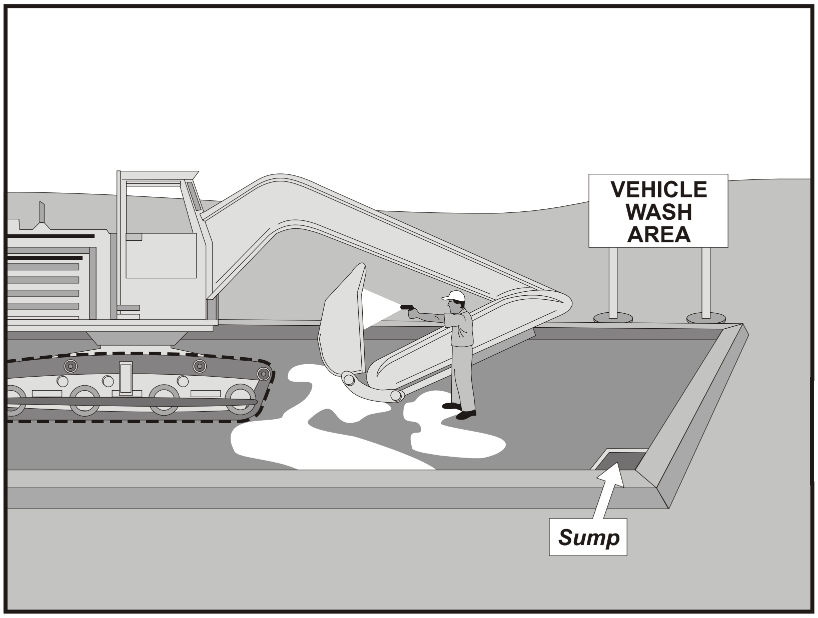
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.

- Educate employees and subcontractors on pollution prevention measures.

- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.

- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.

- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.

- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:

  - Located away from storm drain inlets, drainage facilities, or watercourses

  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff

  - Configured with a sump to allow collection and disposal of wash water

  - No discharge of wash waters to storm drains or watercourses

  - Used only when necessary

- When cleaning vehicles and equipment with water:

  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered

  - Use positive shutoff valve to minimize water usage

  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

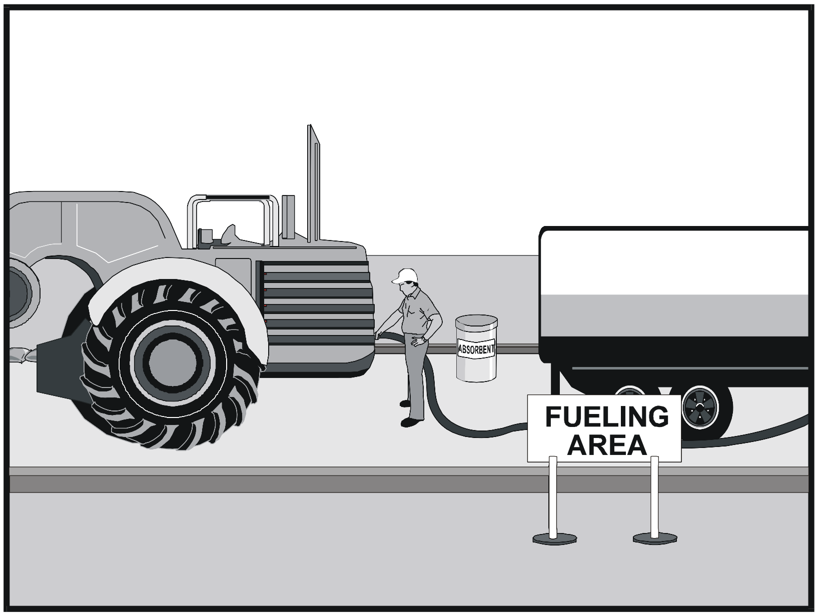
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

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

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.

- Discourage "topping-off" of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.

- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.

- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.

- Train employees and subcontractors in proper fueling and cleanup procedures.

- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.

- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.

- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.

- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.

- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).

- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.

- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

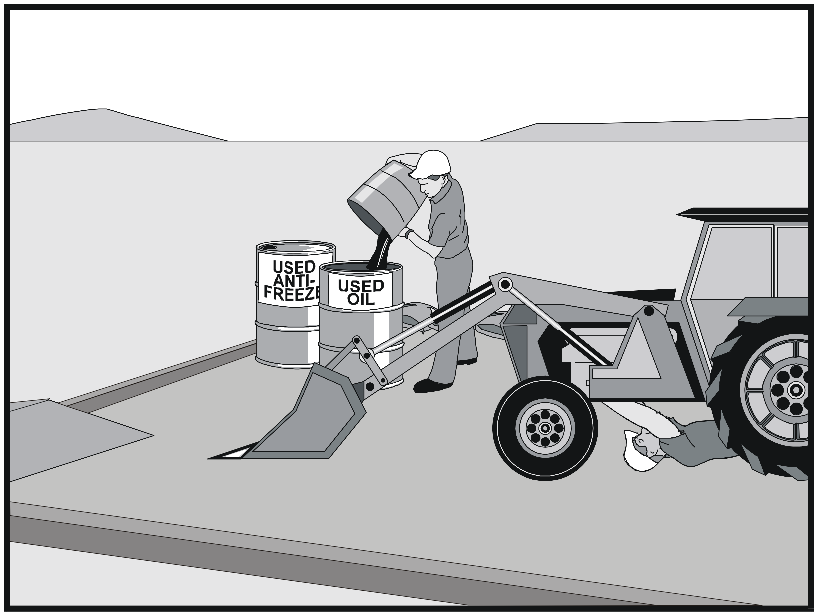
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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

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

Vehicle & Equipment Maintenance NS-10



Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.

- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.

- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.

- Place a stockpile of spill cleanup materials where it will be readily accessible.

- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.

- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.

- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.

- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.

- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.

- Train employees and subcontractors in proper maintenance and spill cleanup procedures.

- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.

- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.

- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.

- Do not place used oil in a dumpster or pour into a storm drain or watercourse.

- Properly dispose of or recycle used batteries.

- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.

- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.

- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

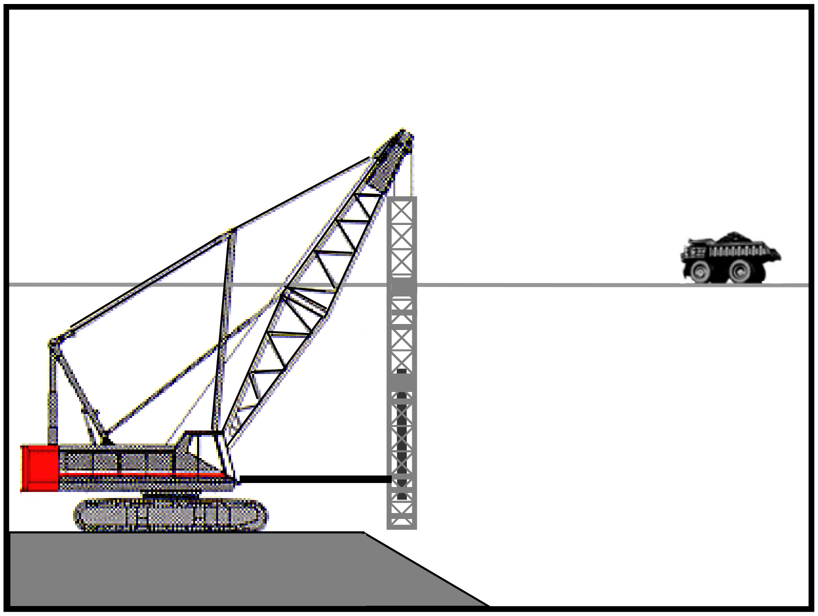
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

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

Pile Driving Operations NS-11



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of precast concrete, steel, or timber. Driven sheet piles are also used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations will reduce or eliminate the discharge of potential pollutants to the storm drain system, watercourses, and waters of the United States.

Suitable Applications

These procedures apply to all construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving (impact and vibratory) takes place, including operations using pile shells as well as construction of cast-in-steel-shell and cast-in-drilled-hole piles.

Limitations

None identified.

Implementation

- Use drip pans or absorbent pads during vehicle and equipment operation, maintenance, cleaning, fueling, and storage. Refer to NS-8, Vehicle and Equipment Cleaning, NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.

- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4, Spill Prevention and Control.

- Equipment that is stored or in use in streambeds, or on docks, barges, or other structures over water bodies should be kept leak free.

- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water must comply with all applicable permits.

- Implement other BMPs as applicable, such as NS-2, Dewatering Operations, WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

- When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runon and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.

- Use less hazardous products, e.g., vegetable oil, when practicable.

Costs

All of the above measures can be low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

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

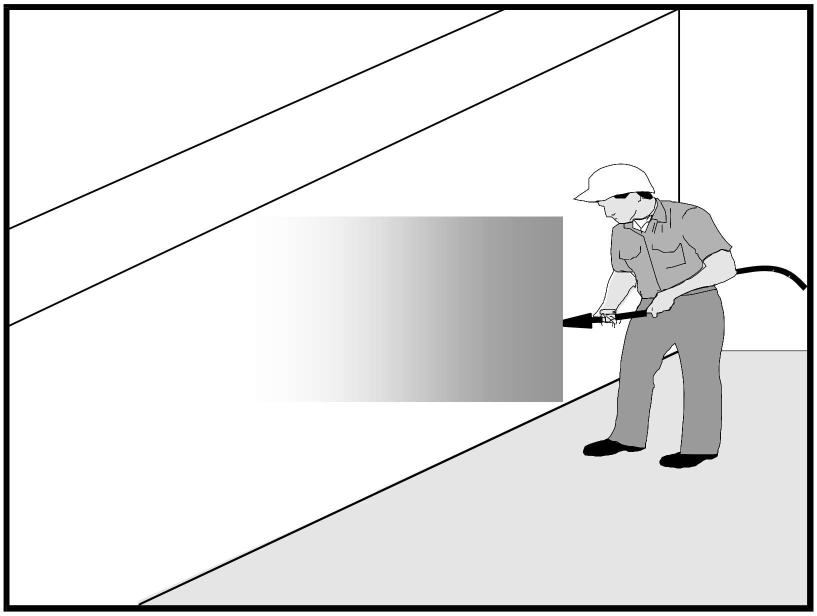
- Inspect equipment every day at startup and repair equipment as needed (i.e., worn or damaged hoses, fittings, and gaskets). Recheck equipment at shift changes or at the end of the day and scheduled repairs as needed.

References

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

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

Concrete Curing NS-12



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

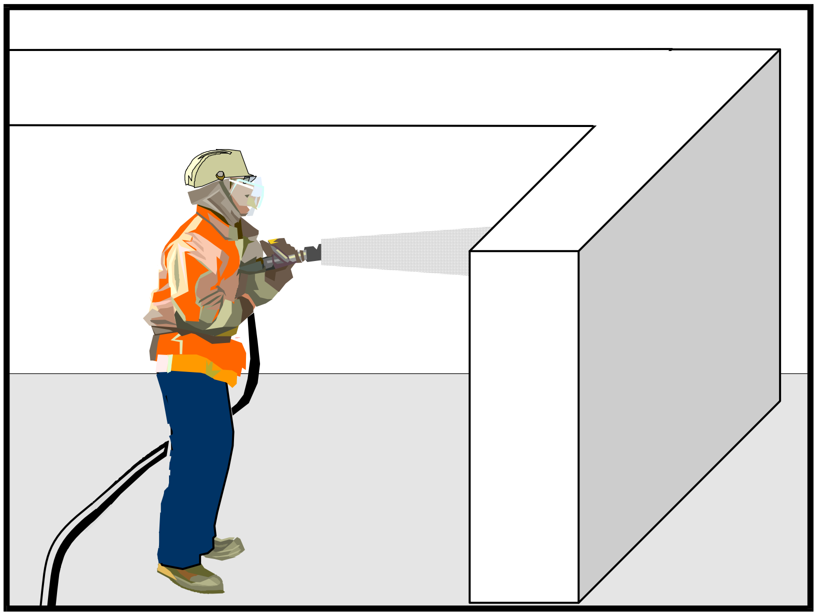
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor’s superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

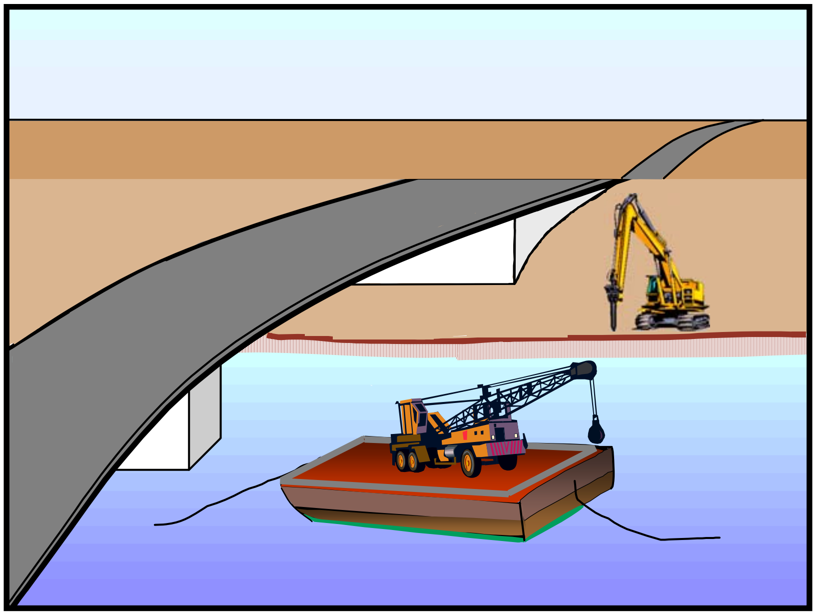
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

Material Over Water NS-14



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.

Suitable Applications

Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse including waters of the United States. These procedures should be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedances of water quality standards.

Limitations

Dredge and fill activities are regulated by the US Army Corps of Engineers and Regional Boards under Section 404/401 of the Clean Water Act.

Implementation

- Refer to WM-1, Material Delivery and Storage and WM-4, Spill Prevention and Control.

- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill clean up materials is available.

- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is expected to be idle for more than 1 hour.

- Maintain equipment in accordance with NS-10, Vehicle and Equipment Maintenance. If a leaking line cannot be repaired, remove equipment from over the water.

- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.

- Secure all materials to prevent discharges to receiving waters via wind.

- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the use of the materials, deployment and access of control measures, and reporting measures.

- In case of spills, contact the local Regional Board as soon as possible but within 48 hours.

- Refer to WM-5, Solid Waste Management (non-hazardous) and WM-6, Hazardous Waste Management. Ensure the timely and proper removal of accumulated wastes

- Comply with all necessary permits required for construction within or near the watercourse, such as Regional Water Quality Control Board, U.S. Army Corps of Engineers, Department of Fish and Game or and other local permitting.

- Discharges to waterways should be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures contained in SWPPP.

Costs

These measures are generally of low to moderate cost. Exceptions are areas for temporary storage of materials, engine fluids, or wastewater pump out.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Ensure that employees and subcontractors implement the appropriate measures for storage and use of materials and equipment.

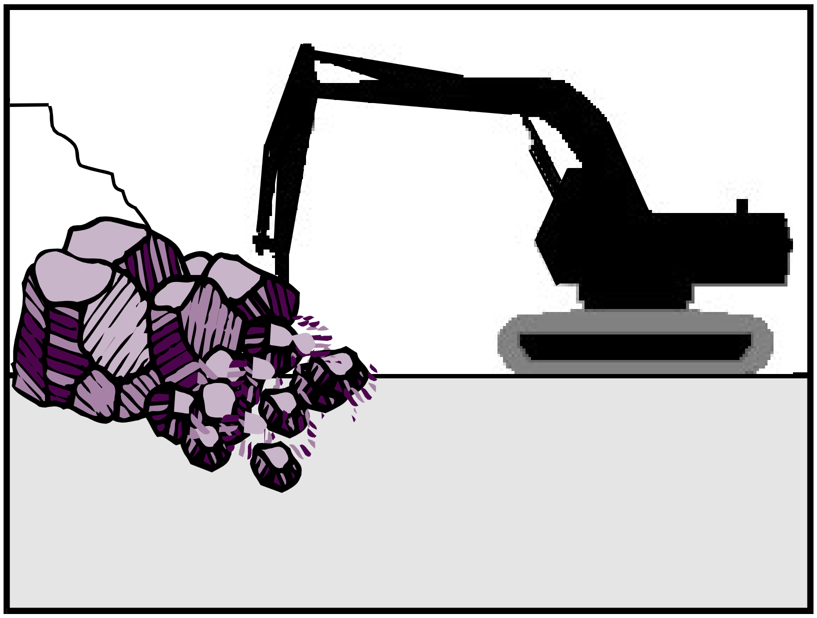
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the water courses, including waters of the United States.

References

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

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

Demolition Adjacent to Water NS-15



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

Full bridge demolition and removal, partial bridge removal (barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

Limitations

None identified.

Implementation

- Refer to NS-5, Clear Water Diversion, to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the owner.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with WM-3, Stockpile Management.
- Ensure safe passage of wildlife, as necessary.

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- Discharges to waterways shall be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures in the SWPPP.

- For structures containing hazardous materials, i.e., lead paint or asbestos, refer to BMP WM-6, Hazardous Waste Management. For demolition work involving soil excavation around lead-painted structures, refer to WM-7, Contaminated Soil Management.

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from runon and runoff.

References

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

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

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

The construction of roads, bridges, retaining walls, and other large structures in remote areas, often requires temporary batch plant facilities to manufacture Portland Cement Concrete (PCC) or asphalt cement (AC). Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout. 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 General Permit draft incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements). Many types of batch plant materials, including mortar, concrete, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows which may cause an exceedence of the General Permit Requirements.

Suitable Applications

These procedures typically apply to construction sites where temporary batch plant facilities are used; however, some of the practices described are applicable to construction sites with general concrete use.

Limitations

The General Permit for discharges of stormwater associated with industrial activities (General Industrial Permit) may be applicable to temporary batch plants.

Specific permit requirements or mitigation measures such as Air Resources Board (ARB), Air Quality Management District (AQMD), Air Pollution Control District (APCD, Regional Water Quality Control Board (RWQCB), county ordinances and city ordinances may require alternative mitigation measures for temporary batch plants. Contact the local regulatory agencies to determine if a permit is required.

Implementation

Planning

- Temporary batch plants may be subject to the General Industrial Permit. To obtain a copy of this permit and the application forms, visit http://www.waterboards.ca.gov or contact the State Water Resources Control Board.

- Proper planning, design, and construction of temporary batch plants should be implemented to minimize potential water quality, air pollution, and noise impacts associated with temporary batch plants.

- BMPs and a Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP). BMPs should be implemented, inspected, and maintained in accordance with these plans.

- Temporary batch plants should be managed to comply with AQMD Statewide Registration Program and/or local AQMD Portable Equipment Registration requirements.

- Construct temporary batch plants downwind of existing developments whenever possible.

- Placement of access roads should be planned to mitigate water and air quality impacts.

Layout and Design

- Temporary batch plants should be properly located and designed to mitigate water quality impacts to receiving water bodies. Batch plants should be located away from watercourses, drainage courses, and drain inlets. Batch plants should be located to minimize the potential for stormwater runon onto the site.

- Temporary batch plant facilities (including associated stationary equipment and stockpiles) should be located at least 300 ft from any recreational area, school, residence, or other structure not associated with the construction project.

- Construct continuous interior AC or PCC berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.) to facilitate proper containment and cleanup of releases. Rollover or flip top curbs or dikes should be placed at ingress and egress points (SE-12, Temporary Silt Dike).

- Direct runoff from the paved or unpaved portion of the batch plant into a sump and pipe to a lined washout area or dewatering tank.
- Direct stormwater and non-stormwater runoff from unpaved portions of batch plant facility to catchment ponds or tanks.
- Construct and remove concrete washout facilities in accordance with WM-8, Concrete Waste Management.
- Layout of a typical batch plant and associated BMP is located at the end of this BMP fact sheet.

Operational Procedures

- Washout of concrete trucks should be conducted in a designated area in accordance with WM-8, Concrete Waste Management.
- Do not dispose of concrete into drain inlets, the stormwater drainage system, or watercourses.
- Washing of concrete mixing and transport equipment (including concrete truck washout) should occur in a designated area in accordance with WM-8, Concrete Waste Management.
- Washing equipment, tools, or vehicles to remove PCC should be conducted in accordance with NS-7, Potable Water/Irrigation, NS-8, Vehicle and Equipment Cleaning, and WM-8, Concrete Waste Management..
- All dry material transfer points should be ducted through a fabric or 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 dust-tight service hatches.
- Fabric dust collection system should be capable of controlling particulate matter in accordance with the California Air Resources Control Board and local Air Pollution Control District Regulations.
- Fabric dust collectors (except for vent filters) should be equipped with an operational pressure differential gauge to measure the pressure drop across the filters.
- All transfer points should be equipped with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions.
- All conveyors should be covered, unless the material being transferred results in no visible emissions.

- There should be no visible emissions beyond the property line, while the equipment is being operated.

- 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.

- 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.

- All open-bodied vehicles transporting material should be loaded with a final layer of wet sand and the truck should be covered with a tarp to reduce emissions.

Tracking Control

- Plant roads (batch truck and material delivery truck roads) and areas between stockpiles and conveyor hoppers should be stabilized (TC-2, Stabilized Construction Roadway), watered, treated with dust-suppressant chemicals (WE-1, Wind Erosion Control), or paved with a cohesive hard surface that can be repeatedly swept, maintained intact, and cleaned as necessary to control dust emissions.

- Trucks should not track PCC from plants onto public roads. Use appropriate practices from TC-1, Stabilized Construction Entrance/Exit, to prevent tracking.

Materials Storage

- WM-1, Material Delivery and Storage, should be implemented at all batch plants using concrete components or compounds. An effective strategy is to cover and contain materials.

- WM-2, Material Use should be conducted in a way to minimize or eliminate the discharge of materials to storm drain system or watercourse.

- Ensure that finer materials are not dispersed into the air during operations, such as unloading of cement delivery trucks.

- Stockpiles should be covered and enclosed with perimeter sediment barriers per WM-3, Stockpile Management. Uncovered stockpiles should be sprayed with water and/or dust-suppressant chemicals as necessary to control dust emissions, unless the stockpiled material results in no visible emissions. An operable stockpile watering system should be onsite at all times.

- Store bagged and boxed materials on pallets and cover or store in a completely enclosed storage area on non-working days and prior to rain.

- Minimize stockpiles of demolished PCC by recycling them in a timely manner.

- Provide secondary containment for liquid materials (WM-1, Material Delivery and Storage, WM-10, Liquid Waste Management). Containment should provide sufficient volume to contain precipitation from a 25-year storm plus 10% of the aggregate volume of all containers or plus 100% of the largest container, whichever is greater.

- Handle solid and liquid waste in accordance with WM-5, Solid Waste Management, WM-10, Liquid Waste Management, and WM-8, Concrete Waste Management.

- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Immediately contain and clean up spilled cement and fly ash and contain.

Equipment Maintenance

- Equipment should be maintained to prevent fluid leaks and spills per NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Incorporate other BMPs such as WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

Costs

Costs will vary depending on the size of the facility and combination of BMPs implemented.

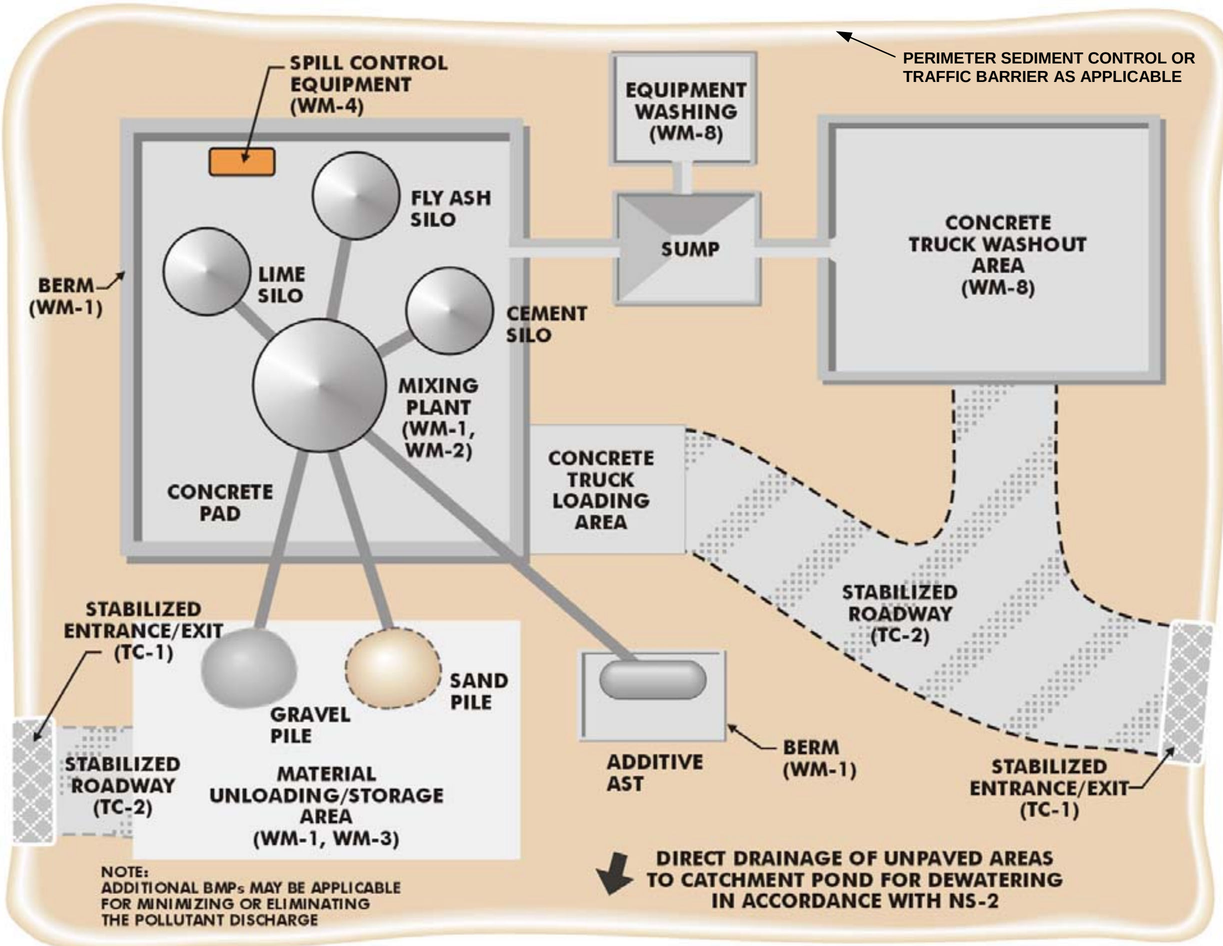
Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts cementitious materials or fly ash as required by the General Permit.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain a Stabilized Construction Entrance/Exit (TC-1) as needed.
- Inspect and maintain stabilized haul roads as needed (TC-2, Stabilized Construction Roadway).
- Inspect and maintain materials and waste storage areas as needed.

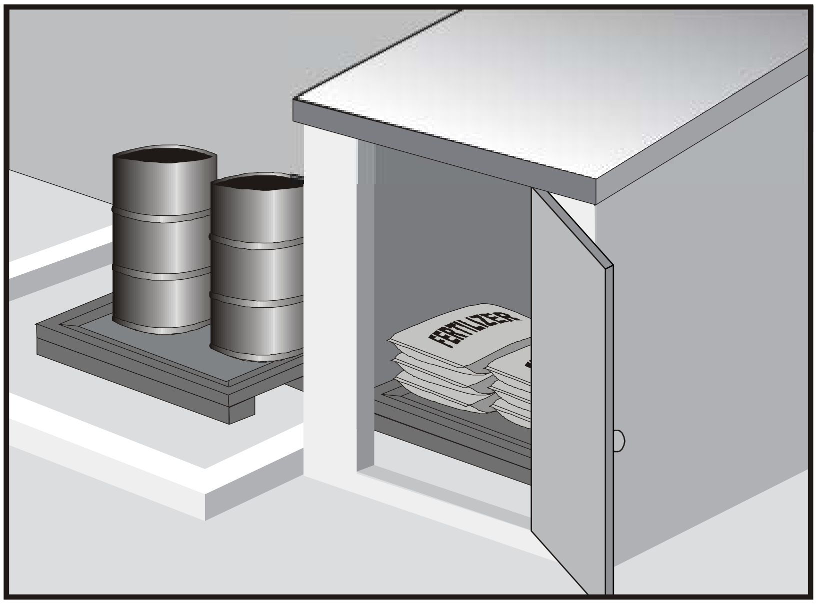
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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



Typical Temporary Batch



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

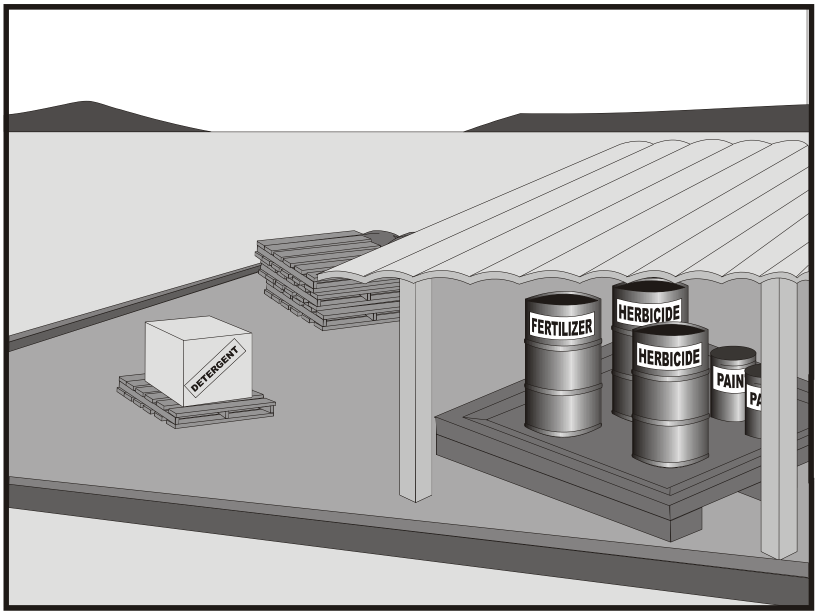
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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

Material Use WM-2



Categories

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

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.

- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.

- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.

- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):

  - Do not treat soil that is water-saturated or frozen.

  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.

  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.

  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).

  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).

  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.

  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.

  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.

- Train employees and subcontractors in proper material use.

- Supply Material Safety Data Sheets (MSDS) for all materials.

- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.

- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.

- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.

- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.

- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.

- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Document the location, time, chemicals applied, and applicator’s name and qualifications.

- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.

- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

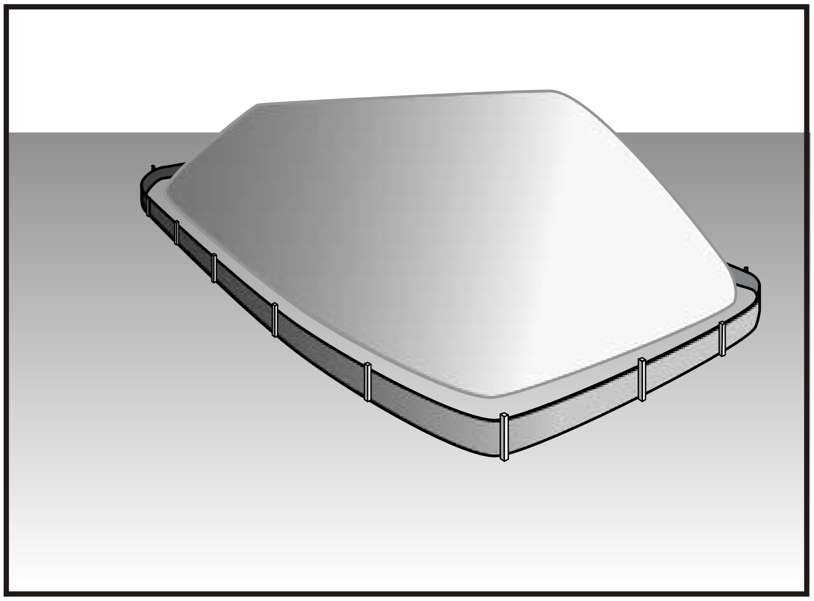
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.

- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.

- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

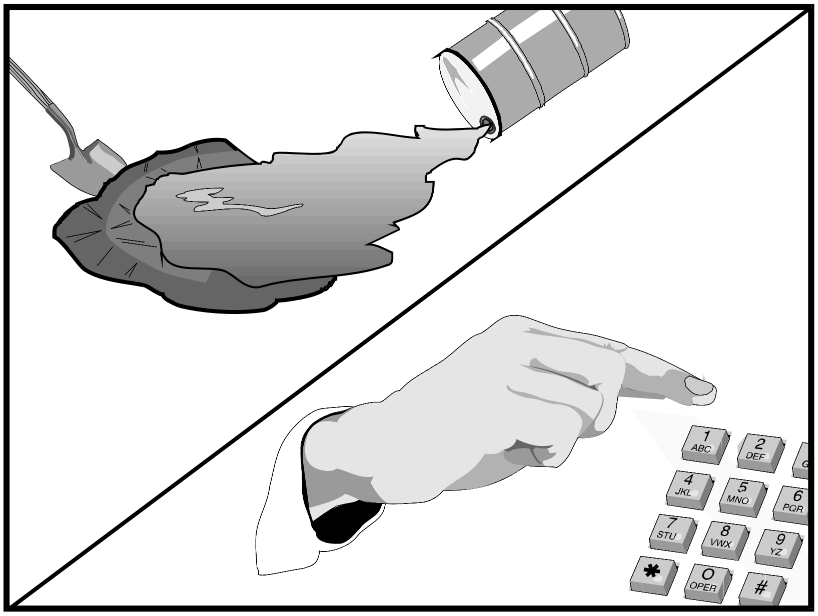
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).

- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.



Categories

EC	Erosion Control	
SE	Sediment Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor’s superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn’t compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in 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).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use 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 materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.

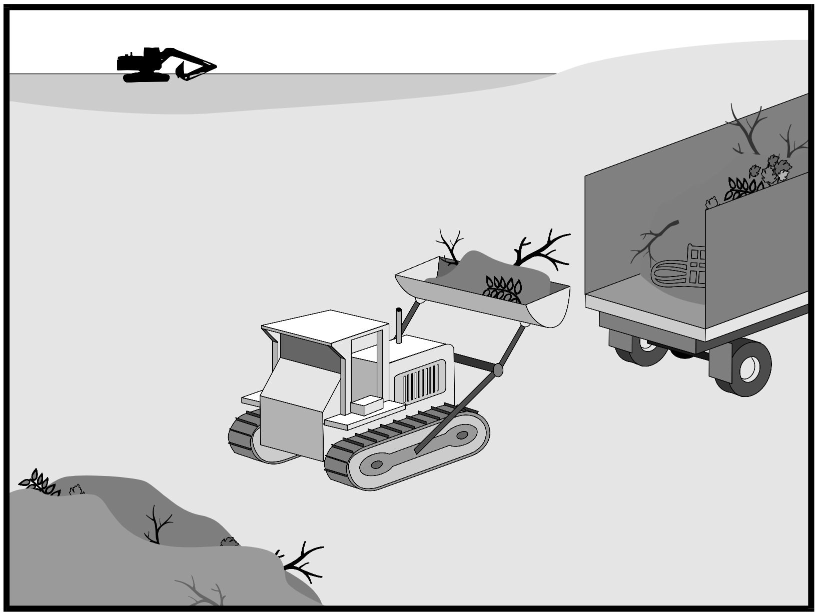
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur

- Inspect construction waste area regularly.

- Arrange for regular waste collection.

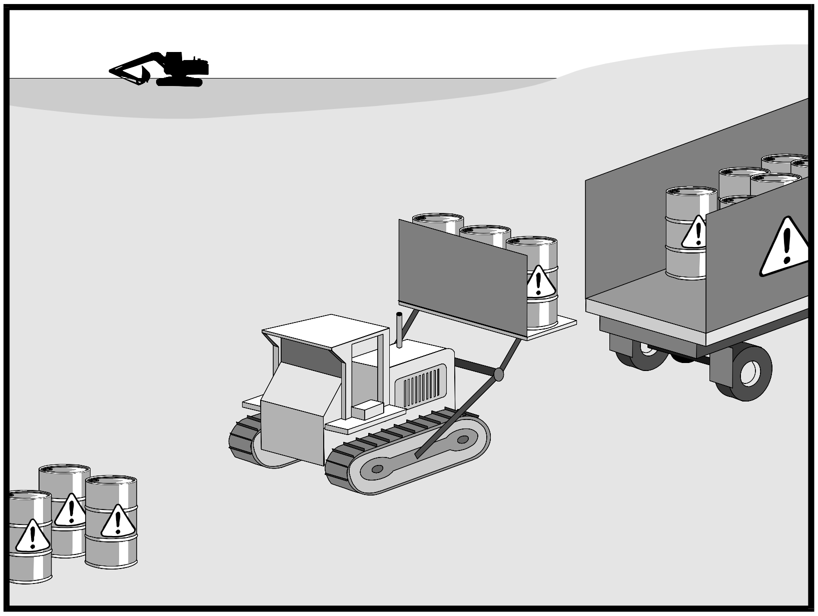
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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

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

Hazardous Waste Management WM-6



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

■ Drums should not be overfilled and wastes should not be mixed.

■ Unless watertight, containers of dry waste should be stored on pallets.

■ Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

■ Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

■ Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. “Paint out” brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

■ The following actions should be taken with respect to temporary contaminant:

- Ensure that adequate hazardous waste storage volume is available.

- Ensure that hazardous waste collection containers are conveniently located.

- Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

- Minimize production or generation of hazardous materials and hazardous waste on the job site.

- Use containment berms in fueling and maintenance areas and where the potential for spills is high.

- Segregate potentially hazardous waste from non-hazardous construction site debris.

- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.

- A copy of the hazardous waste manifests should be provided.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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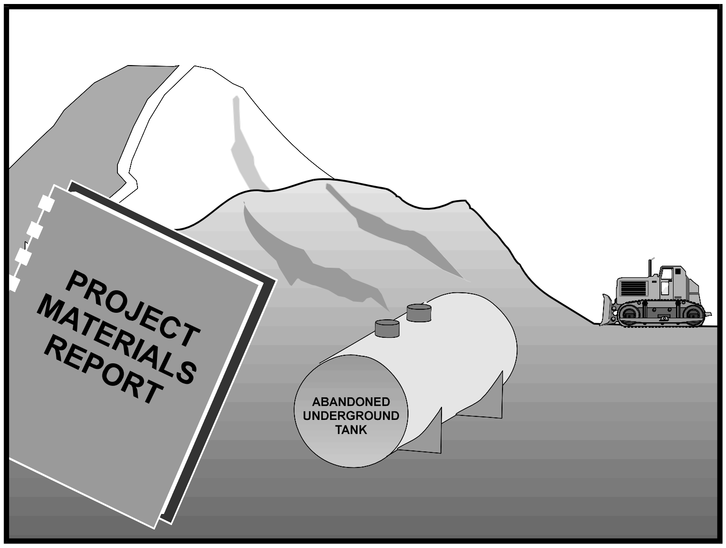
Contaminated Soil Management WM-7



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.

- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.

- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.

- The contractor may further identify contaminated soils by investigating:

  - Past site uses and activities

  - Detected or undetected spills and leaks

  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements

  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.

  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.

- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.

- Excavation, transportation, and placement operations should result in no visible dust.

- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.

- Test suspected soils at an approved certified laboratory.

- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.

- Avoid temporary stockpiling of contaminated soils or hazardous material.

- Take the following precautions if temporary stockpiling is necessary:

    - Cover the stockpile with plastic sheeting or tarps.

    - Install a berm around the stockpile to prevent runoff from leaving the area.

    - Do not stockpile in or near storm drains or watercourses.

- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.

- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.

- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.

- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.

- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.

- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.

- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):

    - United States Department of Transportation (USDOT)

    - United States Environmental Protection Agency (USEPA)

    - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for contractor’s Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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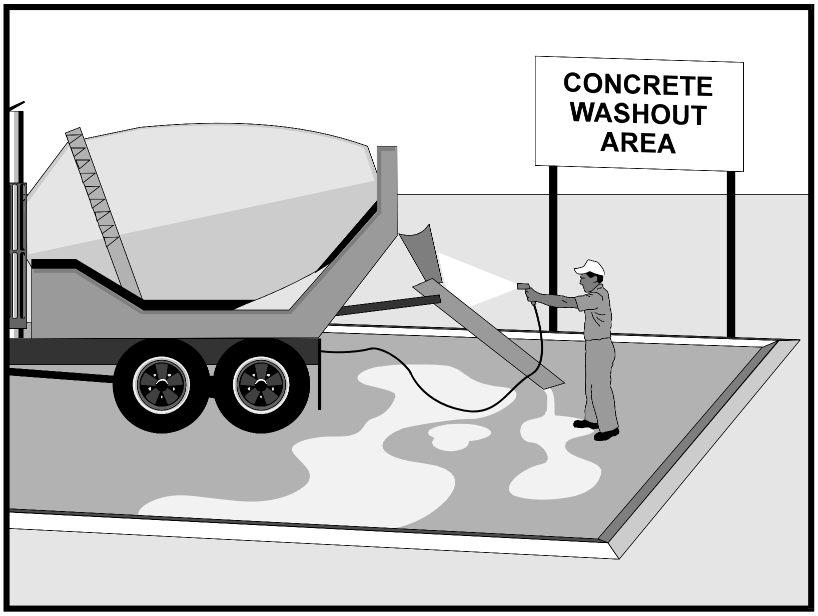
Concrete Waste Management



Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.

- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.

- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-0ff concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

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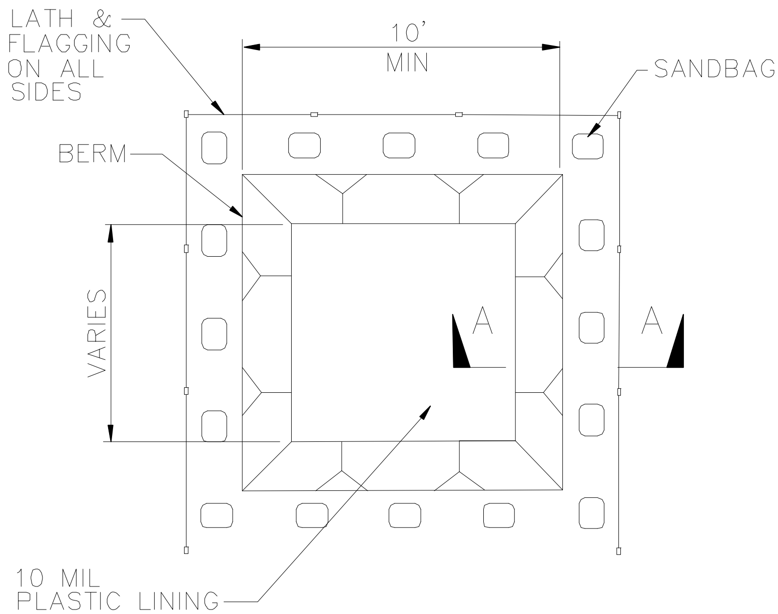

PLAN
NOT TO SCALE
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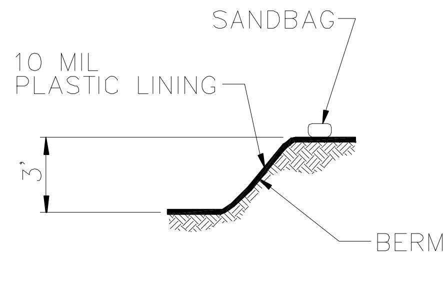
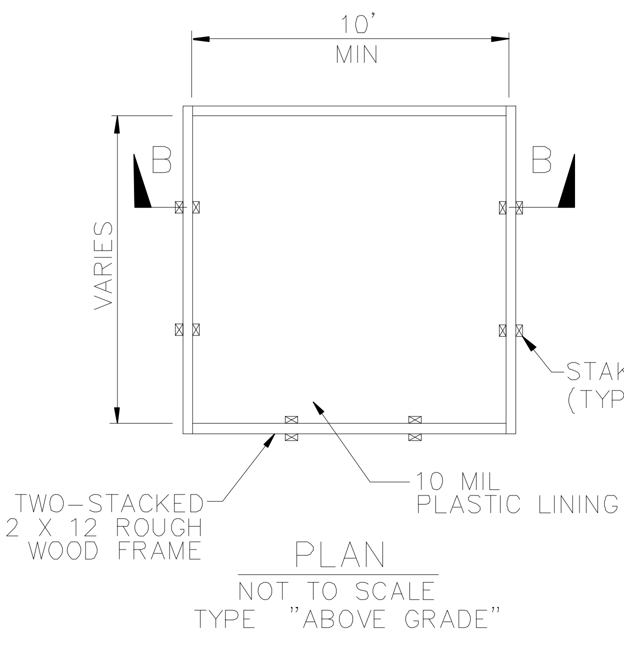
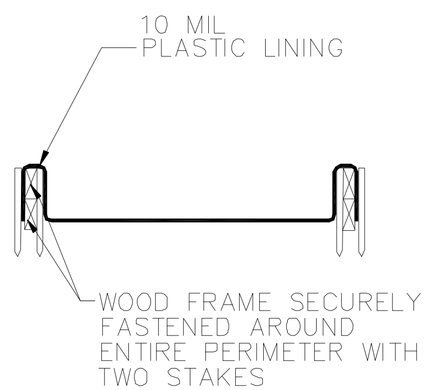


SECTION A–A
NOT TO SCALE



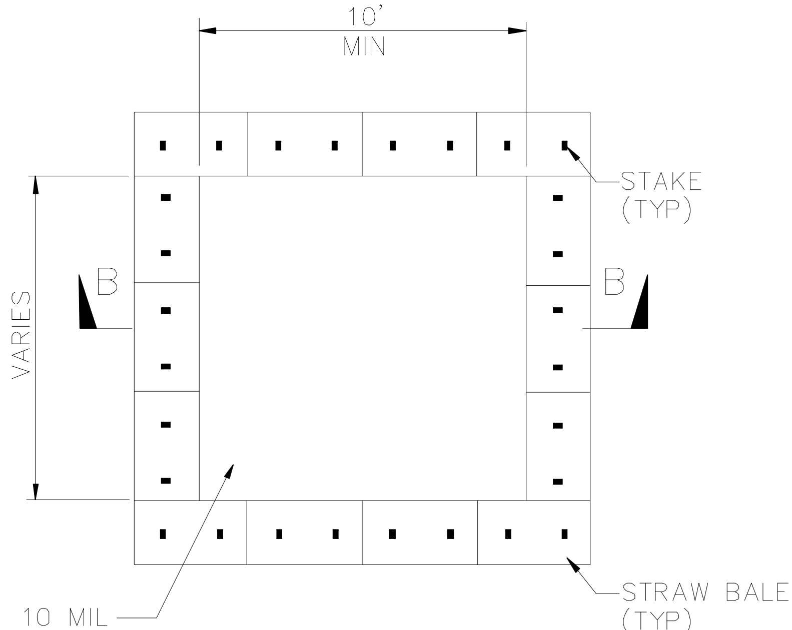
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



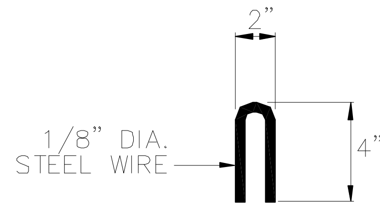
SECTION B–B
NOT TO SCALE

NOTES

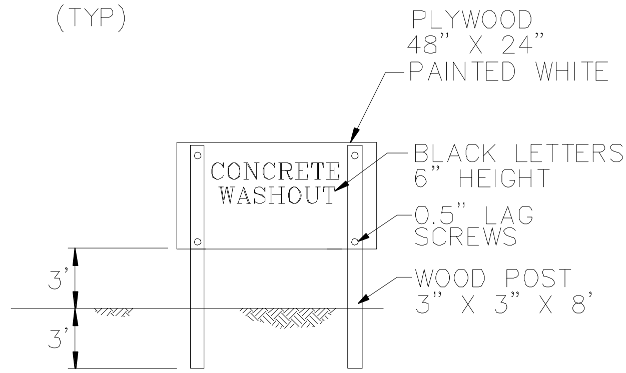
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



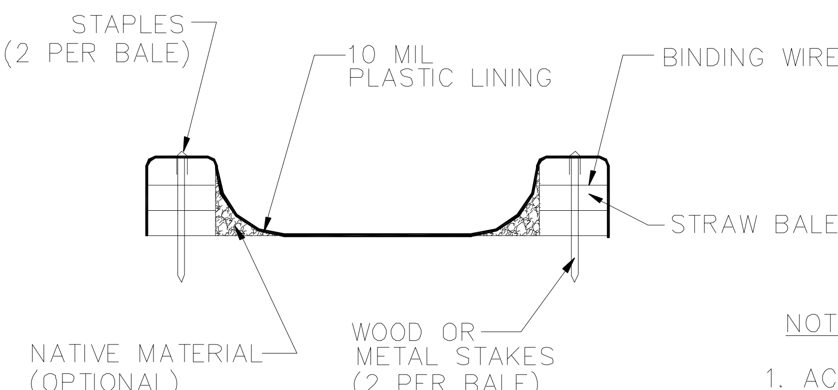
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

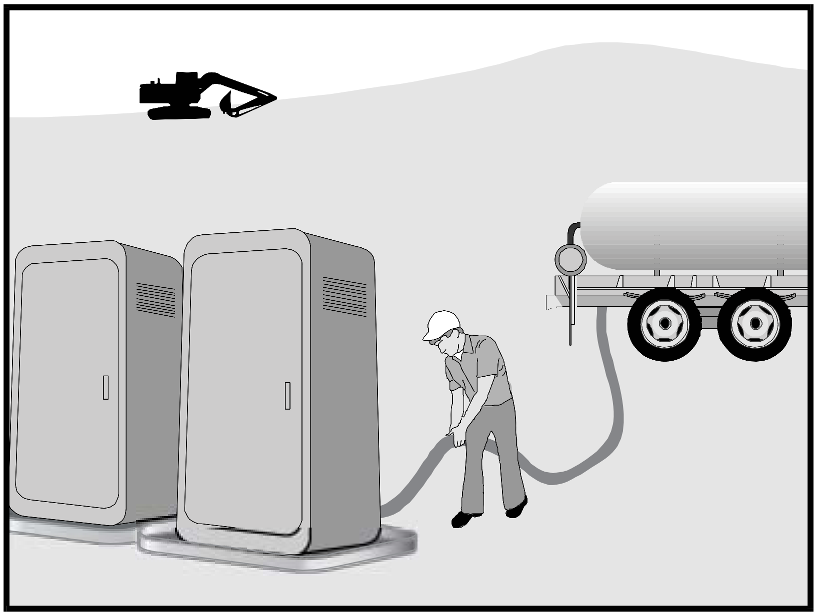


SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Categories

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

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

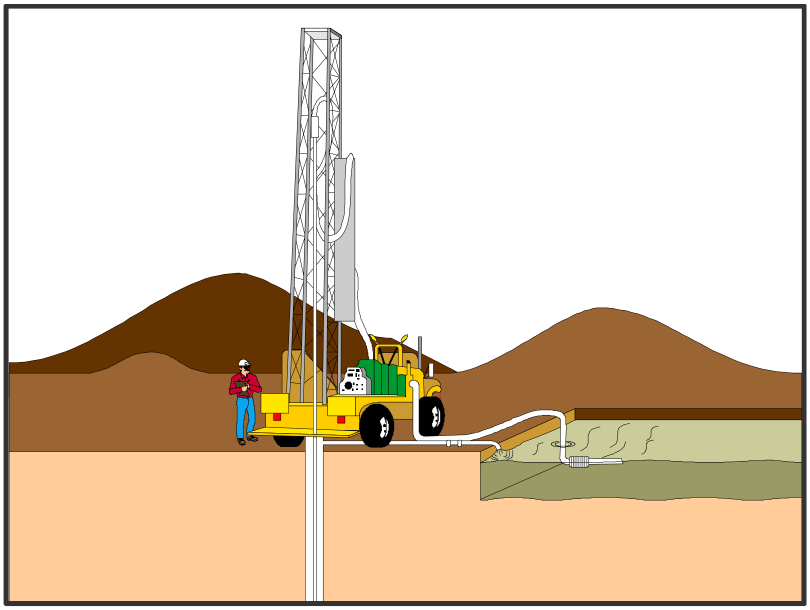
Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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



Categories

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.

- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.

- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.

- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.

- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.

- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.

- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.

- Containment devices must be structurally sound and leak free.

- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.

- Inspect containment areas and capturing devices and repair as needed.

References

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

Section 5
Glossary and List of Acronyms
5.1 Glossary

303(d) Listed: Water bodies listed as impaired as per Section 303(d) of the 1972 Clean Water Act.

Active Areas of Construction: All areas undergoing land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas.

Acute Toxicity Test: Laboratory test in which an organism of interest (e.g., fathead minnow or rainbow trout) is placed in a water sample. By tracking the organism's survival the lab can determine whether the sample water is toxic.

Active Treatment System (ATS): A treatment control BMP that reduces turbidity of the construction site runoff by adding chemicals or using electrical current to enhance flocculation, coagulation and settling of suspended sediment. The two major types of systems are flow-through treatment and batch treatment.

Aquatic: The water environment. Plants and animals that live in the water are referred to as being aquatic.

Bacteria: See pathogens.

Beneficial Uses: As defined in the California Water Code, beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. See also COLD, MIGR, and SPWN.

Benthic Macroinvertebrate: Animals without backbones that are larger than ½ millimeter (the size of a pencil dot). These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. Benthic macroinvertebrates include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs. See http://www.epa.gov/bioindicators/html/benthosclean.html for common organisms.

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

Bioassessment: Procedure for measuring the quality of a stream or river by analyzing the aquatic life present.

Biofilter Bags: Plastic mesh bag filled with 100% recycled wood product waste. They come in a variety of sizes and are used to detain flow and allowing a slow rate of discharge through the wood media.

Cartridge Filter: Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed.

Catch Basin (Also known as Inlet): Box-like underground concrete structure with openings in curbs and gutters designed to collect runoff from streets and pavement.

Check Dam: A small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams are used to reduce the effective slope of the channel and flow velocity, which allows sediment to settle out of suspension.

Clay A particle size class consisting of sediment particles less than 0.002 mm in diameter.

Clean Water Act (CWA): (33 U.S.C. 1251 et seq.) requirements of the NPDES program are defined under Sections 307, 402, 318 and 405 of the CWA.

COLD: Abbreviation for the Cold Freshwater Habitat Beneficial Use, which designates uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Compost: Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste; it is organic and biodegradable and can be left on site.

Compost Berm: A dike of compost with a trapezoidal cross-section used to intercept sheet flow when placed perpendicular to runoff flow.

Compost Blanket: A layer of compost applied at the appropriate thickness onto slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. Provides organic matter and nutrients important for plant growth.

Compost Sock: Mesh sock containing compost used as a three-dimensional biodegradable filtering structure to intercept runoff where sheet flow occurs.

Concrete Curing: Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete Finishing: General term for methods used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Applications include sand blasting, shot blasting, grinding, or high pressure water blasting.

Construction Activity: Includes clearing, grading, excavation, and contractor activities that result in soil disturbance.

Denuded: Land stripped of vegetation or land that has had its vegetation worn down due to the impacts from the elements or humans.

Detention: The capture and subsequent release of stormwater runoff from the site at a slower rate than it is collected, the difference being held in temporary storage.

Dewatering Bag: See gravity bag filter.

Dewatering Operations: Practices that manage the discharge of pollutants when non-stormwater and/or stormwater must be removed from a work location to proceed with construction work or to provide vector control.

Dewatering Tank: A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Direct Discharge: A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff. Typically a direct discharge is not commingled within the conveyance with runoff and flow from other land uses or other properties

Discharge: A release or flow of stormwater or other substance from a conveyance system or storage container. Broader – includes release to storm drains, etc.

Disking: A mechanical method of roughening the upper layer of soil to reduce competing vegetation, improve water infiltration, and prepare for planting.

Effluent Limitations: Limitations on amounts of pollutants that may be contained in a discharge. Can be expressed in a number of ways including as a concentration, as a concentration over a time period (e.g., 30-day average must be less than 20 mg/l), or as a total mass per time unit, or as a narrative limit.

Erosion: The wearing away of land surface by wind or water. Erosion occurs naturally from weather or runoff but can be intensified by land-clearing practices related to farming, new development, redevelopment, road building, or timber cutting.

Erosion Control: Erosion control is any source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water, or wind.

Fiber Rolls: A tight tubular roll made of straw, coir, or other biodegradable materials wrapped in netting which can be photodegradable or natural. Used along the contour or at the toe of a slope to intercept runoff, reduce flow velocity, and release the runoff as sheet flow, and provide some removal of sediment from the runoff.

Fines: Refers to soil particles (sediment) that fall within the clay or silt size fractions.

(Construction) General Permit: A National Pollutant Discharge Elimination System (NPDES) permit issued by the State Water Resources Control Board for the discharge of stormwater associated with construction activity from soil disturbance of one acre or more.

Grading: The cutting or filling of the land surface to a desired slope or elevation.

Gravel Bag Berm: Series of gravel-filled bags placed on a level contour to intercept sheet flow.

Gravity Bag Filter: A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Gross Pollutants: Typically refers to visible pollutants such as trash, debris, and floatables, which may create an aesthetic "eye sore" in waterways, but may also include heavy metals, pesticides, and bacteria in stormwater. Gross pollutants also include plant debris (such as leaves and lawn-clippings), animal excrement, street litter, and other organic matter.

Gully Erosion: Erosion that occurs where the volume of runoff is concentrated, flowing water cuts deep into the soil bringing together separate rills into larger channels called gullies. Gully erosion acts like rill erosion on a larger scale.

Hazardous Waste: A waste or combination of wastes that, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either cause or significantly contribute to an increase in mortality or an increase in serious irreversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity) or appears on special EPA or state lists. Regulated under the federal Resource Conservation and Recovery Act and the California Health and Safety Code.

High Risk of High pH Discharge: A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.

Hydraulic Mulch: Hydraulic mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Hydroseeding: Typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind.

Illicit Discharges: Any discharge to a MS4 or receiving water that is not in compliance with applicable laws and regulations, e.g. is not discharged pursuant to an NPDES permit or applicable exemption or waiver.

Impervious Surface: Ground cover that prevents the infiltration of water into the soil, such as pavement and buildings.

Inactive Areas of Construction: Areas of construction activity that have been disturbed but which are not currently being worked and are not scheduled to be re-disturbed for at least 14 days.

Index Period: The period of time during which bioassessment samples must be collected to produce results suitable for assessing the biological integrity of streams and rivers. In-stream communities naturally vary over the course of a year, and sampling during the index period ensures that samples are collected during a time frame when communities are stable so that year-to-year consistency is obtained. Index periods differ for different parts of the state.

Industrial General Permit: The NPDES General Permit (No. CAS000001) issued by the State Water Resources Control Board for discharge of stormwater associated with industrial activity. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/industrial.shtml.

Inlet: An entrance into a ditch, storm drain, or other waterway.

Integrated Pest Management (IPM): An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism.

Leaching: Infiltration or percolation below the soil surface, which is perceived as a loss. Typically refers to fertilizers or salts being pushed below the plant rooting zone by rain or irrigation water.

Legally Responsible Person (LRP): The person possessing the title of the land on which the construction activities will occur. When ownership is by a corporation or public agency, the LRP is the appropriate corporate officer or public official as defined in the General Permit.

Linear Underground/Overhead Project (LUP): Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquiescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities.

MIGR: Abbreviation for the Migration of Aquatic Organisms Beneficial Use, which designates uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) designed or used for collecting or conveying stormwater; (ii) which is not a combined sewer; and (iii) which is not part of a Publicly Owned Treatment Works (POTW) as defined at Title 40 of the Code of Federal Regulations (CFR) 122.2. A "Small MS4" is defined as an MS4 that is not a permitted MS4under the Phase I regulations. This definition of a Small MS4 applies to MS4 operated within cities and counties as well as governmental facilities that have a system of storm sewers.

Non-Stormwater Discharge: Any discharge to MS4 or receiving water that is not composed entirely of stormwater.

Non-Point Source Pollution: Pollution that originates from diffuse contamination that does not originate from a single discrete source and specifically does not come from a point source as defined by the Clean Water Act. Non-point source pollution can originate from aerial diffuse sources, agriculture, forests, and runoff that does not flow through a MS4, industrial, or construction operation subject to an NPDES permit.

Notice of Intent (NOI): Part of the required Permit Registration Documents, which provides information on the owner, location, type of project, and certifies that the owner will comply with the conditions of the construction General Permit.

Notice of Termination (NOT): Formal notice to SWRCB submitted by owner/developer that a construction project is complete and the project has met the conditions to terminate the permit.

NPDES Permit: NPDES is an acronym for National Pollutant Discharge Elimination System. NPDES is the national program for administering and regulating Sections 307, 318, 402, and 405 of the CWA. In California, the State Water Resources Control Board (SWRCB) has issued a General Permit for stormwater discharges associated with construction activities (see Appendix A).

Numeric Action Level (NAL): An allowable range or threshold for a particular water quality measurement to gauge the performance of the measures or practices used at a site to minimize the discharge of pollutants. The General Permit includes NALs for pH and turbidity; however these action levels are not directly enforceable.

Numeric Effluent Limitation (NEL): Numeric effluent limitations are used to assess compliance with the General Permit. An allowable range or maximum are stated for a particular water quality measurement and exceedances of the NEL is considered a permit violation and is directly enforceable.

Nutrients: Compounds necessary for plant and animal growth. In regards to water quality, the term usually refers to nitrogen and phosphorus compounds. These nutrients can result in excessive or accelerated growth of vegetation, such as algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the forms of nitrogen) can be toxic to fish.

Oil and Grease: Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants and waste oil disposal.

Organics: Compounds that are carbon based. Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed.

Outfall: The end point where storm drains discharge water into a waterway.

Pathogens: Refers to bacteria and viruses that cause disease. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming.

Permit Registration Documents: A formal notice to SWRCB submitted by the owner of a construction site that said owner seeks coverage under the General Permit for discharges associated with construction activities.

Pesticide: Any substance used to eliminate pests. Pesticides include herbicides, fungicides, rodenticides, and insecticides.

pH: A measure of the acidic or basic nature of a solution. The typical pH scale ranges from 0 to 14, with pure water being neutral and having a pH of 7. Values above 7 are considered basic and pH values less than 7 are acidic, relative to how far they deviate from neutral (pH=7).

(Construction) Phases: The General Permit recognizes four distinct phases of construction activities: (1) Grading and Land Development Phase, (2) Streets and Utilities Phase, (3) Vertical Construction Phase, and (4) Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants and some General Permit requirements are tailored to the construction phase.

Photodegradable: A material that breaks down or degrades in sunlight.

Point Source: Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant: Generally, any substance introduced into the environment that adversely affects the usefulness of a resource.

Pollution Prevention (P2): Practices and actions that reduce or eliminate the generation of pollutants.

Polyacrylamide (PAM): Substance available in a variety of forms used to aggregate soil particles allowing them to settle out of suspension.

Precipitation: Any form of rain or snow.

Pressurized Bag Filter: A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Pretreatment: Treatment of waste stream before it is discharged to a collection system.

Qualified SWPPP Developer (QSD): Individual who is authorized to develop and revise SWPPPs.

Effective July 1, 2010, a QSD shall have one of the following credentials:

a. A California registered professional civil engineer;
b. A California registered professional geologist or engineering geologist;
c. A California registered landscape architect;
d. A professional hydrologist registered through the American Institute of Hydrology;
e. A Certified Professional in Erosion and Sediment Control (CPESC) registered through EnviroCert International, Inc.;
f. A Certified Professional in Storm Water Quality (CPSWQ) registered through EnviroCert International, Inc.; or

g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective September 2, 2011, a QSD shall have attended a SWRCB-sponsored or approved QSD training course.

Qualified SWPPP Practitioner (QSP): Individual assigned responsibility for the implementation of all elements of the SWPPP, including non-stormwater and stormwater visual observations, sampling and analysis, and preparation of Rain Event Action Plans.

Effective September 2, 2011, a QSP shall have attended a SWRCB-sponsored or approved QSP training course and shall be either a QSD or have one of the following credentials:

a. A Certified Erosion, Sediment and Storm Water Inspector (CESSWI) registered through EnviroCert International, Inc.; or
b. A Certified Inspector of Sediment and Erosion Control (CISEC) registered through Certified Inspector of Sediment and Erosion Control, Inc.

Qualifying Storm/Rain Event: Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events.

Rain Event Action Plan (REAP): Written document, specific for each rain event, that when implemented is designed to protect all exposed portions of the site within 48 hours of any likely precipitation event. REAPs are prepared by the QSP based on the predicted rain event and construction phase.

Receiving water: A river, lake, stream, estuary, bay, or ocean into which runoff is discharged.

Retention: The storage of stormwater to prevent it from leaving the development site.

Revised Universal Soil Loss Equation (RUSLE): A formula for determining soil loss in tons per acre according to different site specific variables. The equation is written as follows:

$$A=(R)(K)(LS)(C)(P)$$

Where:

R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor
P = management operations and support practices

Rill Erosion: Rills are channels small enough to be smoothed over by normal tillage. Rill erosion takes place when water concentrates in these small channels and carries sediment in the water flow.

Riparian: Refers to the habitat located adjacent to rivers or streams.

Rolled Erosion Control Products (RECP): These products, also known as geotextiles and mats, can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces.

Runoff: Water originating from rainfall, melted snow, and other sources (e.g., sprinkler irrigation) that flows over the land surface to drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands.

Run-on: Off-site stormwater surface flow or other surface flow which enters your site.

Sand: A soil particle between 0.05 and 2.0 mm in diameter.

Sandbag Barrier: Series of sand-filled bags placed on a level contour to intercept or divert sheet flows of water.

Sand Media Particulate Filter: Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Scour: The erosive and digging action in a watercourse caused by flowing water.

Secondary Containment: Structures, usually dikes or berms, surrounding tanks or other storage containers, designed to catch spilled materials from the storage containers.

Sedimentation: The process of depositing soil particles, clays, sands, or other sediments that were picked up by runoff.

Sediment: Soil, sand, and minerals washed from land into water, usually after rain, that collect in reservoirs, rivers, and harbors, destroying fish nesting areas and clouding the water, thus preventing sunlight from reaching aquatic plants. Farming, mining, and building activities without proper implementation of BMPs will expose sediment materials, allowing them to be washed off the land after rainfalls.

Sediment Basin: A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging.

Sediment Control: Sediment controls are treatment control practices that trap soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them.

Sediment Transport Capacity: The capability of a channel to move sediment, this varies under different flow conditions.

Sediment Trap: A temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging.

Sheet Erosion: Sheet erosion is relatively uniform erosion from the entire soil surface.

Significant Materials: Includes, but not limited to, raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designed under Section 101(14) of CERLCA; any chemical the facility is required to report pursuant to Section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with stormwater discharges.

Significant Quantities: The volume, concentrations, or mass of a pollutant in stormwater discharge that can cause or threaten to cause pollution, contamination, or nuisance that adversely impact human health or the environment and cause or contribute to a violation of any applicable water quality standards for receiving water.

Silt: A soil particle size class consisting of particles between 0.05 and 0.002 mm in diameter. These particles are smaller than sand and larger than clay.

Silt Fence: A silt fence is used to detain sediment-laden water, promoting sedimentation behind the fence. Silt fences are made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support.

Soil Binder: Material applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites. Soil binders are typically applied to disturbed areas requiring short term temporary protection.

Soil Preparation: Steps taken to prepare soil for planting or the installation of a BMP. Soil preparation may include tilling, raking, or the addition of a soil amendment.

Source Control BMPs: Operational practices that reduce potential pollutants at the source.

Source Reduction (also source control): The technique of stopping and/or reducing pollutants at their point of generation so that they do not come into contact with stormwater.

SPWN: Abbreviation for the Spawning, Reproduction, and/or Early Development Beneficial Use, which designates uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Stockpile Management: Procedures and practices that are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Storm Drains: Above- and below-ground structures for transporting stormwater to streams or outfalls for flood control purposes.

Stormwater: Defined as urban runoff and snowmelt runoff consisting only of those discharges, which originate from precipitation events. Stormwater is that portion of precipitation that flows across a surface to the storm drain system or receiving waters.

Stormwater Discharge Associated with Industrial Activity: Discharge from any conveyance which is used for collecting and conveying stormwater from an area that is directly related to manufacturing, processing, or raw materials storage activities at an industrial plant.

Stormwater Pollution Prevention Plan (SWPPP): A written plan that documents the series of phases and activities that, first, characterizes your site, and then prompts you to select and carry out actions which prevent the pollution of stormwater discharges.

Straw Mulch: Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Temporary Batch Plant: During the construction of large structures or in remote locations, a temporary batch plant may be necessary to manufacture Portland Cement Concrete (PCC) or AC. Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout.

Temporary Silt Dike: Pre-manufactured device that is installed for semi-permanent drainage and sediment control on the perimeter of disturbed sites or stockpiles of materials or as check dams within channels.

Tracking Control: Tracking control refers to methods of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area.

Traditional Construction Project: Most construction projects, including but not limited to commercial, residential, industrial, institutional, and highway construction project. Does not include those projects defined as LUPs.

Treatment Control BMPs: Treatment methods to remove pollutants from stormwater.

Toxicity: Adverse responses of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

Turbidity: Describes the ability of light to pass through water. The cloudy appearance of water caused by suspended and colloidal matter (particles).

Urban Runoff: Stormwater from city streets and adjacent domestic or commercial properties that carries pollutants of various kinds into the sewer systems and receiving waters.

Vector: Organism that spreads disease (e.g., mosquitos and rodents).

Vegetation: Living plant matter.

Virus: See pathogens.

Wadeable Stream: Streams that can be sampled by field crews wearing chest waders (generally less that 0.5 m-1.0 meters deep)

Waste Management: Source control management practices that prevent pollution by limiting or reducing potential pollutants at their source, before they come into contact with stormwater. Practices under this category can be thought of as “good housekeeping” and include procedural and structural BMPs for handing, storing, and disposing of wastes generated by a construction project.

Weir Tank: A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Wetland: An area of land that has water-saturated soils for long periods of time and water loving vegetation. Wetlands are typically flooded for part of the year, forming a transitional area between aquatic and terrestrial environments.

Wind Erosion Control: Methods used to minimize wind erosion. Controls consist of applying water or other dust palliatives to prevent or alleviate dust nuisance.

5.2 List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ADL	Aerially Deposited Lead
AIMP	Impervious Area
AINF	Infiltration Area
ANSI	American National Standards Institute
APCD	Air Pollution Control District
APHA	American Public Health Association
APWA	American Public Works Association
ARB	Air Resources Board
ARS	Agricultural Research Service
AQMD	Air Quality Management District
ASTM	American Society for Testing Materials
ATS	Active Treatment System
AWWA	American Water Works Association
BAT	Best Available Technology (economically available)
BCT	Best Conventional Technology (pollution control)
BFM	Bonded Fiber Matrix
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
CA	Contractor Activities
CAL-EPA	California Environmental Protection Agency
CAL-OSHA	California Division of Occupational Safety and Health Administration
CASQA	California Stormwater Quality Association
CCR	California Code of Regulations
CCS	Cellular Confinement System
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESSWI	Certified Erosion, Sediment, and Storm Water Inspector
CFR	Code of Federal Regulations
CISEC	Certified Inspector of Erosion and Sediment Control
COC	Chain of Custody

COE	United States Army Corps of Engineers, also known as, USACE
CPESC	Certified Professional in Erosion and Sediment Control
CPI	Coalescing Plate Interceptor
CPSWQ	Certified Professional in Storm Water Quality
CSMP	Construction Site Monitoring Program
CWA	Clean Water Act (Federal Water Pollution Control Act of 1972 as amended in 1987)
DCIA	Directly Connected Impervious Area
DFG	(California) Department of Fish and Game
DG	Decomposed Granite
DHS	Department of Health Services
DTSC	California Department of Toxic Substances Control
EC	Erosion Control
EEC	Effect Effluent Concentration
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ELG	Effluent Limitation Guideline
ELAP	Environmental Laboratory Accreditation Program
EMC	Event Mean Concentration
EOS	Equivalent Opening Size
EPA	United States Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GIS	Geographical Information System
Hazmat	Hazardous Material
HCM	Hydraulic Compost Matrix
HDPE	High-Density Polyethylene
HM	Hydraulic Matrix
HSG	Hydrologic Soil Groups
IPM	Integrated Pest Management
LOEC	Lowest Observed Effect Concentration
LOI	Loss-On-Ignition

LUP	Linear Underground/Overhead Project
LRP	Legally Responsible Person
MATC	Maximum Allowable Threshold Concentration
MBAS	Methylene Blue Activated Substances
MBFM	Mechanically-Bonded Fiber Matrix
MEP	Maximum Extent Practicable
MDL	Method Detection Limit
MS4	Municipal Separate Storm Sewer System
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
MSRP	Monitoring, Sampling & Reporting Plan
NAL	Numeric Action Level
NEL	Numeric Effluent Limitation
NELAP	National Environmental Laboratory Accreditation Program
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NS	Non-stormwater Management
NSF	National Science Foundation
NTU	Nephelometric Turbidity Unit
NURP	National Urban Runoff Program
O&G	Oil and Grease
O&M	Operations and Maintenance
OSDS	On-site Disposal System
OSHA	Occupational Safety and Health Administration
P2	Pollution Prevention
PAHs	Poly-Aromatic Hydrocarbons

PAM	Polyacrylamide
PCBs	Polychlorinated Biphenyls
PCC	Portland Cement Concrete
PH	Professional Hydrologist
PLS	Pure Live Seed
PPT	Pollution Prevention Team
PoP	Probability of Precipitation
POTW	Publicly Owned Treatment Works
PRD	Permit Registration Document
PSD	Particle Size Distribution
QA	Quality Assurance
QC	Quality Control
QSD	Qualified SWPPP Developer
QSP	Qualified SWPPP Practitioner
RCRA	Resource Conservation and Recovery Act
REAP	Rain Event Action Plan
RECP	Rolled Erosion Control Product
RUSLE	Revised Universal Soil Loss Equation
RWQCB	Regional Water Quality Control Board
SAFIT	Southwestern Association of Freshwater Invertebrate Taxonomists
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SCP	Scientific Collecting Permit
SE	Sediment Control
SIC	Standard Industrial Classification
SFM	Stabilized Fiber Matrix
SM	Standard Mulch
SMARTS	Stormwater Multi Application and Report Tracking System
SPCC	Spill Prevention Control and Countermeasure
SSC	Suspended Sediment Concentration
STE	Standard Taxonomic Effort
SUSMP	Standard Urban Stormwater Mitigation Plan
SVOC	Semi-Volatile Organic Compound
SWAMP	Surface Water Ambient Monitoring Program

SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TC	Tracking Control
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TMECC	Test Methods for the Examination of Composting and Compost
TOC	Total Organic Carbon
TRM	Turf Reinforcement Mat
TSP	Trisodium phosphate
TSS	Total Suspended Solids
UFC	Uniform Fire Code
USACE	United States Army Corps of Engineers, also known as, COE
USC	United States Code
USCC	United States Compost Council
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
UV	Ultraviolet
VOCs	Volatile Organic Compounds
WDID	Waste Discharge Identification (Number)
WDR	Water Discharge Requirement
WE	Wind Erosion Control
WEF	Water Environment Federation
WET	Whole Effluent Toxicity
WM	Waste Management

Appendix A
Construction General Permit

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Arnold Schwarzenegger
Governor

Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
Fax (916) 341-5463 • http://www.waterboards.ca.gov

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

List of Documents included in this single file saved in pdf format on September 22, 2009:

- Fact Sheet
- Order
- Attachment A – Linear Underground/Overhead Requirements
- Attachment A.1 – LUP Project Type Determination
- Attachment A.2 – LUP Permit Registration Documents
- Attachment B – Permit Registration Documents
- Attachment C – Risk Level 1 Requirements
- Attachment D – Risk Level 2 Requirements
- Attachment E – Risk Level 3 Requirements
- Attachment F – Active Treatment System Requirements
- Appendix 1 – Risk Determination Worksheet and Sediment-related 303d List
- Appendix 2 – Post-Construction Water Balance
- Appendix 2.1 – Post-Construction Water Balance Calculator
- Appendix 3 - Bioassessment Monitoring Guidelines
- Appendix 4 – Adopted/Implemented Sediment and Non-sediment TMDLs
- Appendix 5 – Glossary
- Appendix 6 - Acronym List
- Appendix 7 – State and Regional Water Board Contacts

Linda S. Adams
Secretary for
Environmental Protection

State Water Resources Control Board

Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
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Arnold Schwarzenegger
Governor

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I. BACKGROUND

A. History

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act [CWA]) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 amendments to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial storm water discharges under the NPDES Program. On November 16, 1990, the U.S. Environmental Protection Agency (USEPA) published final regulations that established storm water permit application requirements for specified categories of industries. The regulations provide that discharges of storm water to waters of the United States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge is in compliance with an NPDES Permit. Regulations (Phase II Rule) that became final on December 8, 1999 lowered the permitting threshold from five acres to one acre.

While federal regulations allow two permitting options for storm water discharges (Individual Permits and General Permits), the State Water Board has elected to adopt only one statewide General Permit at this time that will apply to most storm water discharges associated with construction activity.

On August 19, 1999, the State Water Board reissued the General Construction Storm Water Permit (Water Quality Order 99-08-DWQ). On December 8, 1999 the State Water Board amended Order 99-08-DWQ to apply to sites as small as one acre.

The General Permit accompanying this fact sheet regulates storm water runoff from construction sites. Regulating many storm water discharges under one permit will greatly reduce the administrative burden associated with permitting individual storm water discharges. To obtain coverage under this General Permit, dischargers shall electronically file the Permit Registration Documents (PRDs), which includes a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other compliance related documents required by this General Permit and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Quality Control Boards (Regional Water Boards) may issue General Permits or Individual Permits containing more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers.

B. Legal Challenges and Court Decisions

1. Early Court Decisions

Shortly after the passage of the CWA, the USEPA promulgated regulations exempting most storm water discharges from the NPDES permit requirements. (See 40 C.F.R. § 125.4 (1975); see also *Natural Resources Defense Council v. Costle* (D.C. Cir. 1977) 568 F.2d 1369, 1372 (*Costle*); *Defenders of Wildlife v. Browner* (9th Cir. 1999) 191 F.3d 1159, 1163 (*Defenders of Wildlife*).) When environmental groups challenged this exemption in federal court, the District of Columbia Court of Appeals invalidated the regulation, holding that the USEPA "does not have authority to exempt categories of point sources from the permit requirements of [CWA] § 402." (*Costle*, 568 F.2d at 1377.) The *Costle* court rejected the USEPA's argument that effluent-based storm sewer regulation was administratively infeasible because of the variable nature of storm water pollution and the number of affected storm sewers throughout the country. (*Id.* at 1377-82.) Although the court acknowledged the practical problems relating to storm sewer regulation, the court found the USEPA had the flexibility under the CWA to design regulations that would overcome these problems. (*Id.* at 1379-83.) In particular, the court pointed to general permits and permits based on requiring best management practices (BMPs).

During the next 15 years, the USEPA made numerous attempts to reconcile the statutory requirement of point source regulation with the practical problem of regulating possibly millions of diverse point source discharges of storm water. (See *Defenders of Wildlife*, 191 F.3d at 1163; see also Gallagher, Clean Water Act in Environmental Law Handbook (Sullivan, edit., 2003)
p. 300 (Environmental Law Handbook); Eisen, *Toward a Sustainable Urbanism: Lessons from Federal Regulation of Urban Storm Water Runoff* (1995) 48 Wash. U.J. Urb. & Contemp. L.1, 40-41 [Regulation of Urban Storm Water Runoff].)

In 1987, Congress amended the CWA to require NPDES permits for storm water discharges. (See CWA § 402(p), 33 U.S.C. § 1342(p); *Defenders of Wildlife,* 191 F.3d at 1163; *Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1296.) In these amendments, enacted as part of the Water Quality Act of 1987, Congress distinguished between industrial and municipal storm water discharges. With respect to industrial storm water discharges, Congress provided that NPDES permits "shall meet all applicable provisions of this section and section 1311 [requiring the USEPA to establish effluent limitations under specific timetables]." (CWA § 402(p)(3)(A), 33 U.S.C. § 1342(p)(3)(A); see also *Defenders of Wildlife,* 191 F.3d at 1163-64.)

In 1990, USEPA adopted regulations specifying what activities were considered “industrial” and thus required discharges of storm water associated with those activities to obtain coverage under NPDES permits. (55 Fed. Reg. 47,990 (1990); 40 C.F.R. § 122.26(b)(14).) Construction activities, deemed a subset of the industrial activities category, must also be regulated by an NPDES permit. (40 C.F.R. § 122.26(b)(14)(x)). In 1999, USEPA issued regulations for “Phase II” of storm water regulation, which required most small construction sites (1-5 acres) to be regulated under the NPDES program. (64 Fed. Reg. 68,722; 40 C.F.R. § 122.26(b)(15)(i).)

2. **Court Decisions on Public Participation**

Two recent federal court opinions have vacated USEPA rules that denied meaningful public review of NPDES permit conditions. On January 14, 2003, the Ninth Circuit Court of Appeals held that certain aspects of USEPA’s Phase II regulations governing MS4s were invalid primarily because the general permit did not contain express requirements for public participation. (*Environmental Defense Center v. USEPA* (9th Cir. 2003) 344 F.3d 832.) Specifically, the court determined that applications for general permit coverage (including the Notice of Intent (NOI) and Storm Water Management Program (SWMP)) must be made available to the public, the applications must be reviewed and determined to meet the applicable standard by the permitting authority before coverage commences, and there must be a process to accommodate public hearings. (*Id.* at 852-54.) Similarly, on February 28, 2005, the Second Circuit Court of Appeals held that the USEPA's confined animal feeding operation (CAFO) rule violated the CWA because it allowed dischargers to write their own nutrient management plans without public review. (*Waterkeeper Alliance v. USEPA* (2d Cir. 2005) 399 F.3d 486.) Although neither decision involved the issuance of construction storm water permits, the State Water Board’s Office of Chief Counsel has recommended that the new General Permit address the courts’ rulings where feasible[1].

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[1] In *Texas Independent Producers and Royalty Owners Assn. v. USEPA* (7th Cir. 2005) 410 F.3d 964, the Seventh Circuit Court of Appeals held that the USEPA’s construction general permit was not required to provide the public with the opportunity for a public hearing on the Notice of Intent or Storm Water Pollution Prevention Plan. The Seventh Circuit briefly discussed why it agreed with the Ninth Circuit’s dissent in *Environmental Defense Center*, but generally did not discuss the substantive holdings in *Environmental Defense Center* and *Waterkeeper Alliance*, because neither court addressed the initial question of whether the plaintiffs had standing to challenge the permits at issue. However, notwithstanding the Seventh Circuit’s decision, it is not binding or controlling on the State Water Board because California is located within the Ninth Circuit.

The CWA and the USEPA's regulations provide states with the discretion to formulate permit terms, including specifying best management practices (BMPs), to achieve strict compliance with federal technology-based and water quality-based standards. (*Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1308.) Accordingly, this General Permit has developed specific BMPs as well as numeric action levels (NALs) and numeric effluent limitations (NELs) in order to achieve these minimum federal standards. In addition, the General Permit requires a SWPPP and REAP (another dynamic, site-specific plan) to be developed but has removed all language requiring the discharger to implement these plans – instead, the discharger is required to comply with specific requirements. By requiring the dischargers to implement these specific BMPs, NALs, and NELs, this General Permit ensures that the dischargers do not "write their own permits." As a result this General Permit does not require each discharger's SWPPP and REAP to be reviewed and approved by the Regional Water Boards.

This General Permit also requires dischargers to electronically file all permit-related compliance documents. These documents include, but are not limited to, NOIs, SWPPPs, annual reports, Notice of Terminations (NOTs), and numeric action level (NAL) exceedance reports. Electronically submitted compliance information is immediately available to the public, as well as the Regional Water Quality Control Board (Regional Water Board) offices, via the Internet. In addition, this General Permit enables public review and hearings on permit applications when appropriate. Under this General Permit, the public clearly has a meaningful opportunity to participate in the permitting process.

C. Blue Ribbon Panel of Experts and Feasibility of Numeric Effluent Limitations

In 2005 and 2006, the State Water Board convened an expert panel (panel) to address the feasibility of numeric effluent limitations (NELs) in California's storm water permits. Specifically, the panel was asked to address:

"Is it technically feasible to establish numeric effluent limitations, or some other quantifiable limit, for inclusion in storm water permits? How would such limitations or criteria be established, and what information and data would be required?"

"The answers should address industrial general permits, construction general permits, and area-wide municipal permits. The answers should also address both technology-based limitations or criteria and water quality-based limitations or criteria. In evaluating establishment of any objective criteria, the panel should address all of the following:

The ability of the State Water Board to establish appropriate objective limitations or criteria;

How compliance determinations would be made;

The ability of dischargers and inspectors to monitor for compliance; and

The technical and financial ability of dischargers to comply with the limitations or criteria."

Through a series of public participation processes (State Water Board meetings, State Water Board workshops, and the solicitation of written comments), a number of water quality, public process and overall program effectiveness problems were identified. Some of these problems are addressed through this General Permit.

D. Summary of Panel Findings on Construction Activities

The panel's final report can be downloaded and viewed through links at www.waterboards.ca.gov or by clicking here[2].

The panel made the following observations:

"Limited field studies indicate that traditional erosion and sediment controls are highly variable in performance, resulting in highly variable turbidity levels in the site discharge."

"Site-to-site variability in runoff turbidity from undeveloped sites can also be quite large in many areas of California, particularly in more arid regions with less natural vegetative cover and steep slopes."

"Active treatment technologies involving the use of polymers with relatively large storage systems now exist that can provide much more consistent and very low discharge turbidity. However, these technologies have as yet only been applied to larger construction sites, generally five acres or greater. Furthermore, toxicity has been observed at some locations, although at the vast majority of sites, toxicity has not occurred. There is also the potential for an accidental large release of such chemicals with their use."

"To date most of the construction permits have focused on TSS and turbidity, but have not addressed other, potentially significant pollutants such as phosphorus and an assortment of chemicals used at construction sites."

"Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors."

"The quality of storm water discharges from construction sites that effectively employ BMPs likely varies due to site conditions such as climate, soil, and topography."

"The States of Oregon and Washington have recently adopted similar concepts to the Action Levels described earlier."

In addition, the panel made the following conclusions:

"It is the consensus of the Panel that active treatment technologies make Numeric Limits technically feasible for pollutants commonly associated with storm water discharges from construction sites (e.g. TSS and turbidity) for larger construction sites. Technical practicalities and cost-effectiveness may make these technologies less feasible for smaller sites, including small drainages within a larger site, as these technologies have seen limited use at small construction sites. If chemical addition is not permitted, then Numeric Limits are not likely feasible."

"The Board should consider Numeric Limits or Action Levels for other pollutants of relevance to construction sites, but in particular pH. It is of particular concern where fresh concrete or wash water from cement mixers/equipment is exposed to storm water."

"The Board should consider the phased implementation of Numeric Limits and Action Levels, commensurate with the capacity of the dischargers and support industry to respond."

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[2] http://www.waterboards.ca.gov/stormwtr/docs/numeric/swpanel_final_report.pdf

E. How the Panel's Findings are Used in this General Permit

The State Water Board carefully considered the findings of the panel and related public comments. The State Water Board also reviewed and considered the comments regarding statewide storm water policy and the reissuance of the Industrial General Permit. From the input received the State Water Board identified some permit and program performance gaps that are addressed in this General Permit. The Summary of Significant Changes (below) in this General Permit are a direct result of this process.

F. Summary of Significant Changes in This General Permit

The State Water Board has significant changes to Order 99-08-DWQ. This General Permit differs from Order 99-08-DWQ in the following significant ways:

Rainfall Erosivity Waiver: this General Permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.

Technology-Based Numeric Action Levels: this General Permit includes NALs for pH and turbidity.

Technology-Based Numeric Effluent Limitations: this General Permit contains daily average NELs for pH during any construction phase where there is a high risk of pH discharge and daily average NELs turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/ Best Conventional Pollutant Control Technology (BCT) standard) and the traditional, numeric receiving water limitations for turbidity.

Risk-Based Permitting Approach: this General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk.

Minimum Requirements Specified: this General Permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.

Project Site Soil Characteristics Monitoring and Reporting: this General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

Effluent Monitoring and Reporting: this General Permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to determine compliance with the NELs and evaluate whether NALs included in this General Permit are exceeded.

Receiving Water Monitoring and Reporting: this General Permit requires some Risk Level 3 dischargers to monitor receiving waters and conduct bioassessments.

Post-Construction Storm Water Performance Standards: this General Permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts.

Rain Event Action Plan: this General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

Annual Reporting: this General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.

Certification/Training Requirements for Key Project Personnel: this General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

Linear Underground/Overhead Projects: this General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

II. RATIONALE

A. General Permit Approach

A general permit for construction activities is an appropriate permitting approach for the following reasons:

1. A general permit is an efficient method to establish the essential regulatory requirements for a broad range of construction activities under differing site conditions;

2. A general permit is the most efficient method to handle the large number of construction storm water permit applications;

3. The application process for coverage under a general permit is far less onerous than that for individual permit and hence more cost effective;

4. A general permit is consistent with USEPA's four-tier permitting strategy, the purpose of which is to use the flexibility provided by the CWA in designing a workable and efficient permitting system; and

5. A general permit is designed to provide coverage for a group of related facilities or operations of a specific industry type or group of industries. It is appropriate when the discharge characteristics are sufficiently similar, and a standard set of permit requirements can effectively provide environmental protection and comply with water quality standards for discharges. In most cases, the general permit will provide sufficient and appropriate management requirements to protect the quality of receiving waters from discharges of storm water from construction sites.

There may be instances where a general permit is not appropriate for a specific construction project. A Regional Water Board may require any discharger otherwise covered under the General Permit to apply for and obtain an Individual Permit or apply for coverage under a more specific General Permit. The Regional Water Board must determine that this General Permit does not provide adequate assurance that water quality will be protected, or that there is a site-specific reason why an individual permit should be required.

B. Construction Activities Covered

1. **Construction activity subject to this General Permit:**

Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or sale of one or more acres of disturbed land surface.

Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to USEPA regulations, such as dairy barns or food processing facilities.

Construction activity associated with LUPs including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[3]

Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction[4] (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction projects that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the project.

2. Linear Underground/Overhead Projects (LUPs) subject to this General Permit:

Underground/overhead facilities typically constructed as LUPs include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Water Quality Order 2003-0007-DWQ regulated construction activities associated with small LUPs that resulted in land disturbances greater than one acre, but less than five acres. These projects were considered non-traditional construction projects. Attachment A of this Order now regulates all construction activities from LUPs resulting in land disturbances greater than one acre.

3. Common Plan of Development or Sale

USEPA regulations include the term “common plan of development or sale” to ensure that acreage within a common project does not artificially escape the permit requirements because construction activities are phased, split among smaller parcels, or completed by different owners/developers. In the absence of an exact definition of “common plan of development or sale,” the State Water Board is required to exercise its regulatory discretion in providing a common sense interpretation of the term as it applies to construction projects and permit coverage. An overbroad interpretation of the term would render meaningless the clear “one acre” federal permitting threshold and would potentially trigger permitting of

[3] Pursuant to the Ninth Circuit Court of Appeals’ decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the USEPA’s petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

[4] A construction site that includes a dredge and/or fill discharge to any water of the United States (e.g., wetland, channel, pond, or marine water) requires a CWA Section 404 permit from the U.S. Army Corps of Engineers and a CWA Section 401 Water Quality Certification from the Regional Water Board or State Water Board.

almost any construction activity that occurs within an area that had previously received area-wide utility or road improvements.

Construction projects generally receive grading and/or building permits (Local Permits) from local authorities prior to initiating construction activity. These Local Permits spell out the scope of the project, the parcels involved, the type of construction approved, etc. Referring to the Local Permit helps define “common plan of development or sale.” In cases such as tract home development, a Local Permit will include all phases of the construction project including rough grading, utility and road installation, and vertical construction. All construction activities approved in the Local Permit are part of the common plan and must remain under the General Permit until construction is completed. For custom home construction, Local Permits typically only approve vertical construction as the rough grading, utilities, and road improvements were already independently completed under the a previous Local Permit. In the case of a custom home site, the homeowner must submit plans and obtain a distinct and separate Local Permit from the local authority in order to proceed. It is not the intent of the State Water Board to require permitting for an individual homeowner building a custom home on a private lot of less than one acre if it is subject to a separate Local Permit. Similarly, the installation of a swimming pool, deck, or landscaping that disturbs less than one acre that was not part of any previous Local Permit are not required to be permitted.

The following are several examples of construction activity of less than one acre that would require permit coverage:

a. A landowner receives a building permit(s) to build tract homes on a 100-acre site split into 200 one-third acre parcels, (the remaining acreage consists of streets and parkways) which are sold to individual homeowners as they are completed. The landowner completes and sells all the parcels except for two. Although the remaining two parcels combined are less than one acre, the landowner must continue permit coverage for the two parcels.

b. One of the parcels discussed above is sold to another owner who intends to complete the construction as already approved in the Local Permit. The new landowner must file Permit Registration Documents (PRDs) to complete the construction even if the new landowner is required to obtain a separate Local Permit.

c. Landowner in (1) above purchases 50 additional one half-acre parcels adjacent to the original 200-acre project. The landowner seeks a Local Permit (or amendment to existing Local permit) to build on 20 parcels while leaving the remaining 30 parcels for future development. The landowner must amend PRDs to include the 20 parcels 14 days prior to commencement of construction activity on those parcels.

C. Construction Activities Not Covered

1. Traditional Construction Projects Not Covered

This General Permit does not apply to the following construction activity:

a. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

b. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

c. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

d. Discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction projects in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), which can be found at **http://www.waterboards.ca.gov/lahontan/Adopted_Orders/2005/r6t_2005_0007.pdf**

e. Construction activity that disturbs less than one acre of land surface, unless part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

f. Construction activity covered by an individual NPDES Permit for storm water discharges.

g. Landfill construction activity that is subject to the Industrial General Permit.

h. Construction activity that discharges to Combined Sewer Systems.

i. Conveyances that discharge storm water runoff combined with municipal sewage.

j. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

2. **Linear Projects Not Covered**

a. LUP construction activity does not include linear routine maintenance projects. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements, or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

i. Maintain the original purpose of the facility or hydraulic capacity.

ii. Update existing lines[5] and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.

iii. Repairing leaks.

Routine maintenance does not include construction of new[6] lines or facilities resulting from compliance with applicable codes, standards, and regulations.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must secure new areas,

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[5]Update existing lines includes replacing existing lines with new materials or pipes.
[6]New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

b. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

c. Tie-ins conducted immediately adjacent to "energized" or "pressurized" facilities by the discharger are not considered construction activities where all other LUP construction activities associated with the tie-in are covered by an NOI and SWPPP of a third party or municipal agency.

3. **EPA's Small Construction Rainfall Erosivity Waiver**

EPA's Storm Water Phase II Final Rule provides the option for a Small Construction Rainfall Erosivity Waiver. This waiver applies to small construction sites between 1 and 5 acres, and allows permitting authorities to waive those sites that do not have adverse water quality impacts.

Dischargers eligible for this waiver are exempt from Construction General Permit Coverage. In order to obtain the waiver, the discharger must certify to the State Water Board that small construction activity will occur only when the rainfall erosivity factor is less than 5 ("R" in the Revised Universal Soil Loss Equation). The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a practice that provides interim non-vegetative stabilization can be used for the end of the construction period. The operator must agree (as a condition waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the General Permit have been met. If use of this interim stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with a certification statement constitutes acceptance of and commitment to complete the final stabilization process. The discharger must submit a waiver certification to the State Board prior to commencing construction activities.

USEPA funded a cooperative agreement with Texas A&M University to develop an online rainfall erosivity calculator. Dischargers can access the calculator from EPA's website at: www.epa.gov/npdes/storm water/cgp. Use of the calculator allows the discharger to determine potential eligibility for the rainfall erosivity waiver. It may also be useful in determining the time periods during which construction activity could be waived from permit coverage.

D. Obtaining and Terminating Permit Coverage

The Legally Responsible Person (LRP) must obtain coverage under this General Permit, except in two limited circumstances. First, where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties, the utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit. Second, where there is a lease of a mineral estate (oil, gas, geothermal, aggregate, precious metals, and/or industrial metals), the lessee is responsible for obtaining coverage under the General Permit. To obtain coverage, the LRP or other entity described above must file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

To obtain coverage under this General Permit, LRPs must electronically file the PRDs, which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by this General Permit, and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Boards may issue General Permits or

Individual Permits that contain more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers that obtain coverage under Individual Permits.

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

The application requirements of the General Permit establish a mechanism to clearly identify the responsible parties, locations, and scope of operations of dischargers covered by the General Permit and to document the discharger's knowledge of the General Permit's requirements.

This General Permit provides a grandfathering exception to existing dischargers subject to Water Quality Order No. 99-08-DWQ. Construction projects covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at Risk Level 1. LUP projects covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage at LUP Type 1. The Regional Water Boards have the authority to require Risk Determination to be performed on projects currently covered under Water Quality Order No. 99-08-DWQ and 2003-0007-DWQ where they deem necessary.

LRPs must file a Notice of Termination (NOT) with the Regional Water Board when construction is complete and final stabilization has been reached or ownership has been transferred. The discharger must certify that all State and local requirements have been met in accordance with this General Permit. In order for construction to be found complete, the discharger must install post-construction storm water management measures and establish a long-term maintenance plan. This requirement is intended to ensure that the post-construction conditions at the project site do not cause or contribute to direct or indirect water quality impacts (i.e., pollution and/or hydromodification) upstream and downstream. Specifically, the discharger must demonstrate compliance with the post-construction standards set forth in this General Permit (Section XIII). The discharger is responsible for all compliance issues including all annual fees until the NOT has been filed and approved by the local Regional Water Board.

E. Discharge Prohibitions

This General Permit authorizes the discharge of storm water to surface waters from construction activities that result in the disturbance of one or more acres of land, provided that the discharger satisfies all permit conditions set forth in the Order. This General Permit prohibits the discharge of pollutants other than storm water and non-storm water discharges authorized by this General Permit or another NPDES permit. This General Permit also prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges. In addition, this General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the nine Regional Water Boards. Discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural BMPs. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction projects. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Therefore this General Permit authorizes such discharges provided they meet the following conditions.

These authorized non-storm water discharges must:

1. be infeasible to eliminate;

2. comply with BMPs as described in the SWPPP;

3. filter or treat, using appropriate technology, all dewatering discharges from sedimentation basins;

4. meet the NELs and NALs for pH and turbidity; and

5. not cause or contribute to a violation of water quality standards.

Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMPs designed to keep materials onsite. Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges.

This General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

F. Effluent Standards for All Types of Discharges

1. Technology-Based Effluent Limitations

Permits for storm water discharges associated with construction activity must meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize best available technology economically achievable (BAT) for toxic pollutants and non conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Additionally, these provisions require controls of pollutant discharges to reduce pollutants and any more stringent controls necessary to meet water quality standards. The USEPA has already established such limitations, known as effluent limitation guidelines (ELGs), for some industrial categories. This is not the case with construction discharges. In instances where there are no ELGs the permit writer is to use best professional judgment (BPJ) to establish requirements that the discharger must meet using BAT/BCT technology. This General Permit contains both narrative effluent limitations and new numeric effluent limitations for pH and turbidity, set using the best professional judgment (BPJ) equivalent to BAT and BCT (respectively).

BAT/BCT technologies not only include passive systems such as conventional runoff and sediment control, but also treatment systems such as coagulation/flocculation using sand filtration, when appropriate. Such technologies allow for effective treatment of soil particles less 0.02 mm (medium silt) in diameter. The discharger must install structural controls, as necessary, such as erosion and sediment controls that meet BAT and BCT to achieve compliance with water quality standards. The narrative effluent limitations constitute compliance with the requirements of the CWA.

The numeric effluent limitations for pH and turbidity are based upon BPJ, which authorizes the State Water Board to issue a permit containing “such conditions as the Administrator determines are necessary to carry out the provisions of this Chapter” (CWA § 402(a)(1), 33 U.S.C. § 1342(a)(1).) Because the USEPA has not yet issued an effluent limit guideline for storm water, the State Water Board must use BPJ to consider the appropriate technology for the category or class of point sources, based upon all available information and any unique factors relating to the sources. In addition, the permitting authority must consider a number of factors including the cost of achieving effluent reductions in relation to the effluent reduction benefits, the age of the equipment and facilities, the processes employed and any required process changes, engineering aspects of the control technologies, non-water quality environmental impacts (including energy requirements), and other such other factors as the State Water Board deems appropriate (CWA 304(b)(1)(B)).

Because the permit is an NPDES permit, there is no legal requirement to address the factors set forth in Water Code sections 13241 and 13263, unless the permit is more stringent than what federal law requires. (See *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal.4th 613, 618, 627.) None of the requirements in this permit are more stringent than the minimum federal requirements, which include technology-based requirements achieving BAT/BCT and strict compliance with water quality standards. The inclusion of numeric effluent limitations (NELs) in the permit do not cause the permit to be more stringent than current federal law. NELs and best management practices are simply two different methods of achieving the same federal requirement: strict compliance with state water quality standards. Federal law authorizes both narrative and numeric effluent limitations to meet state water quality standards. The use of NELs to achieve compliance with water quality standards is not a more stringent requirement than the use of BMPs. (State Water Board Order No. WQ 2006-0012 (*Boeing*).) Accordingly, the State Water Board does not need to take into account the factors in Water Code sections 13241 and 13263.

The State Water Board has concluded that the establishment of BAT/BCT will not create or aggravate other environmental problems through increases in air pollution, solid waste generation, or energy consumption. While there may be a slight increase in non-water quality impacts due to the implementation of additional monitoring or the construction of additional BMPs, these impacts will be negligible in comparison with the construction activities taking place on site and would be justified by the water quality benefits associated with compliance.

Considerations related to the processes employed and the changes necessitated by the adoption of the BAT/BCT effluent limits have been assessed throughout the stakeholder process (e.g., the Blue Ribbon Panel and the March 2007 preliminary draft) and are discussed in detail in Section I.C of this Fact Sheet. The following sections set forth the engineering aspects of the control technologies and the rationale for the determination of the numeric effluents for pH and turbidity.

In consideration of the costs for the establishment of BAT and BCT limits for pH and turbidity, existing requirements for the control of storm water pollution from construction sites have been established by USEPA and the previous Construction General Permit (State Water Board Order No. 99-08-DWQ) issued by the State Water Board. The General Permit establishes one, consistent set of performance standards for all levels and types of discharges (i.e., risk, linear utility, and ATS).The only difference is that for each level or type of discharge there may be more or less specific effluent limitations (e.g., the addition of numeric effluent limitations for turbidity applies to level/type 3 discharges). And the numeric effluent limitations themselves represent a minimum technology standard. In other words, the additional numeric effluent limitations, compared to the existing permit's narrative effluent limitations, do not increase compliance requirements; rather, they simply represent a point where one can quantitatively measure compliance with the lower end of the range of required technologies. Therefore, the compliance costs associated with the BAT/BCT numeric effluent limitations in this permit only differ by the costs required to measure compliance with the NELs when compared to the baseline compliance costs to comply with the limitations already established through EPA regulations and the existing Construction General Permit.

The State Water Board estimates these measurement costs to be approximately $1000 per construction site for the duration of the project. This represents the estimated cost of purchasing (or renting) monitoring equipment, in this case a turbidimeter (~$600) and a pH meter (~$400). In some cases the costs may be higher or lower. Costs could be lower if the discharger chooses to design and implement the project in a manner where effluent monitoring is likely to be avoided (e.g., no exposure during wet weather seasons, no discharge due to containment, etc.). Costs could be more if the project is subject to many effluent monitoring events or if the discharger exceeds NALs and/or NELs, resulting in additional monitoring requirements.

i. ***pH NEL***

Given the potential contaminants, the minimum standard method for control of pH in runoff requires the use of preventive measures such as avoiding concrete pours during rainy weather, covering concrete and directing flow away from fresh concrete if a pour occurs during rain, covering scrap drywall and stucco materials when stored outside and potentially exposed to rain, and other housekeeping measures. If necessary, pH-impaired storm water from construction sites can be treated in a filter or settling pond or basin, with additional natural or chemical treatment required to meet pH limits set forth in this permit. The basin or pond acts as a collection point and holds storm water for a sufficient period for the contaminants to be settled out, either naturally or artificially, and allows any additional treatment to take place. The State Water Board considers these techniques to be equivalent to BCT. In determining the pH concentration limit for discharges, the State Water Board used BPJ to set these limitations.

The chosen limits were established by calculating three standard deviations above and below the mean pH of runoff from highway construction sites[7] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.0 to 9.0 pH Units.

ii. ***Turbidity NEL***

The Turbidity NEL of 500 NTU is a technology-based numeric effluent limitation and was developed using three different analyses aimed at finding the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality and cost-effectiveness. The analyses fell into three, main types: (1) an ecoregion-specific dataset developed by Simon et. al. (2004)[8]; (2) Statewide Regional Water Quality Control Board enforcement data; and (3) published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites.

A 1:3 relationship between turbidity (expressed as NTU) and suspended sediment concentration (expressed as mg/L) is assumed based on a review of suspended sediment and turbidity data from three gages used in the USGS National Water Quality Assessment Program:

USGS 11074000 SANTA ANA R BL PRADO DAM CA
USGS 11447650 SACRAMENTO R A FREEPORT CA
USGS 11303500 SAN JOAQUIN R NR VERNALIS CA

The turbidity NEL represents a feasible and cost effective performance standard that is demonstrated to be achievable. Although data has been collected to demonstrate that lower effluent levels may be achievable at some sites, staff cannot conclude at this time that a lower NEL is achievable within all the ecoregions of the state. The NEL represents staff determination that the NEL is the most practicable based on available data. The turbidity NEL represents a bridge between the narrative effluent limitations and receiving water limitations. The NEL limit may be considered an interim performance standard as additional data becomes available for evaluation during the next permit cycle. To support this NEL, State Water Board staff analyzed construction site discharge information (monitoring data, estimates) and receiving water monitoring information.

Since the turbidity NEL represents an appropriate threshold level expected at a site, compliance with this value does not necessarily represent compliance with either the narrative effluent limitations (as enforced through the BAT/BCT standard) or the receiving water limitations. In the San Diego region, some inland surface waters have a receiving water objective for turbidity equal to 20 NTU. Obviously a discharge up to, but not exceeding, the turbidity NEL of 500 NTU may still cause or contribute to the exceedance of the 20 NTU standard. Most of the waters of the State are protected by turbidity objectives based on background conditions.

[7] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.
[8] Simon, A., W.D. Dickerson, and A. Heins. 2004. Suspended-sediment transport rates at the 1.5-year recurrence interval for ecoregions of the United States: transport conditions at the bankfull and effective discharge. Geomorphology 58: pp. 243-262.

Table 1 - Regional Water Board Basin Plans, Water Quality Objectives for Turbidity

REGIONAL WATER BOARD	WQ Objective	Background/Natural Turbidity	Maximum Increase
1 Based	on background	All levels	20%
2 Based	on background	> 50 NTU	10%
3 Based	on background	0-50 JTU 50-100 JTU > 100 JTU	20% 10 NTU 10%
4 Based	on background	0-50 NTU > 50 NTU	20% 10%
5 Based	on background	0-5 NTU 5-50 NTU 50-100 NTU >100 NTU	1 NTU 20% 10 NTU 10%
6 Based	on background	All levels	10%
7 Based	on background	N/A N/A	
8 Based	on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%
9 Inland	Surface Waters, 20 NTU All others, based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%

Table 2 shows the suspended sediment concentrations at the 1.5 year flow recurrence interval for the 12 ecoregions in California from Simon et. al (2004).

Table 2 - Results of Ecoregion Analysis

Ecoregion	Percent of California Land Area	Median Suspended Sediment Concentration (mg/L)
1 9.1		874
4 0.2		120
5 8.8		35.6
6 20.7		1530
7 7.7		122
8 3.0		47.4
9 9.4		284
13 5.2		143
14 21.7		5150
78 8.1		581
80 2.4		199
81 3.7		503
Area-weighted average		1633

If a 1:3 relationship between turbidity and suspended sediment is assumed, the median turbidity is 544 NTU.

The following table is composed of turbidity readings measured in NTUs from administrative civil liberty (ACL) actions for construction sites from 2003 - 2009. This data was derived from the complete listing of construction-related ACLs for the six year period. All ACLs were reviewed and those that included turbidimeter readings at the point of storm water discharge were selected for this dataset.

Table 3 – ACL Sampling Data taken by Regional Water Board Staff

WDID# Regi	on	Discharger	Turbidity (NTU)
5S34C331884	5S Brad	shaw Interceptor Section 6B	1800
5S05C325110	5S Bridal	wood Subdivision	1670
5S48C336297	5S Cheye	nne at Browns Valley	1629
5R32C314271	5R Gri	zzly Ranch Construction	1400
6A090406008	6T	El Dorado County Department of Transportation, Angora Creek	97.4
5S03C346861	5S	TML Development, LLC	1600
6A31C325917	6T	Northstar Village	See Subdata Set

Subdata Set - Turbidity for point of storm water runoff discharge at Northstar Village

Date Turbi	dity (NTU)	Location
10/5/2006	900	Middle Martis Creek
11/2/2006	190	Middle Martis Creek
01/04/2007	36	West Fork, West Martis Creek
02/08/2007	180	Middle Martis Creek
02/09/2007	130	Middle Martis Creek
02/09/2007	290	Middle Martis Creek
02/09/2007	100	West Fork, West Martis Creek
02/10/2007	28	Middle Martis Creek
02/10/2007	23	Middle Martis Creek
02/10/2007	32	Middle Martis Creek
02/10/2007	12	Middle Martis Creek
02/10/2007	60	West Fork, West Martis Creek
02/10/2007	34	West Fork, West Martis Creek

A 95% confidence interval for mean turbidity in an ACL order was constructed. The data set used was a small sample size, so the 500 NTU (the value derived as the NEL for this General Permit) needed to be verified as a possible population mean. In this case, the population refers to a hypothetical population of turbidity measurements of which our sample of 20 represents. A t-distribution was assumed due to the small sample size:

Mean: 512.23 NTU Standard Deviation: 686.85 **Margin of** Error: 321.45 Confidence Interval: 190.78 NTU (Low) 833.68 NTU (High)

Based on a constructed 95% confidence interval, an ACL order turbidity measurement will be between 190.78 – 833.68 NTU. 500 NTU falls within this range. Using the same data set, a small-sample hypothesis test was also performed to test if the ACL turbidity data set contains enough information to cast doubt on choosing a 500 NTU as a mean. 500 NTU was again chosen due to its proposed use as an acceptable NEL value. The test was carried out using a 95% confidence interval. Results indicated that the ACL turbidity data set *does not* contain significant sample evidence to reject the claim of 500 NTU as an acceptable mean for the ACL turbidity population.

There are not many published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites. The most often cited study is a report titled, "Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control" (Horner, Guedry, and Kortenhof 1990, http://www.wsdot.wa.gov/Research/Reports/200/200.1.htm). In a comment letter summarizing this report sent to the State Water Board, the primary author, Dr. Horner, states:

"The most effective erosion control product was wood fiber mulch applied at two different rates along with a bonding agent and grass seed in sufficient time before the tests to achieve germination. Plots treated in this way reduced influent turbidity by more than 97 percent and discharged effluent exhibiting mean and maximum turbidity values of 21 and 73 NTU, respectively. Some other mulch and blanket materials performed nearly as well. These tests demonstrated the control ability of widely available BMPs over a very broad range of erosion potential."

Other technologies studied in this report produced effluent quality at or near 100 NTU. It is the BPJ of the State Water Board staff that erosion control, while preferred, is not always an option on construction sites and that technology performance in a controlled study showing effluent quality directly leaving a BMP is always easier and cheaper to control than effluent being discharged from the project (edge of property, etc.). As a result, it is the BPJ of the State Water Board staff that it is not cost effective or feasible, at this time, for all risk level and type 3 sites in California to achieve effluent discharges with turbidity values that are less than 100 NTU.

To summarize, the analysis showed that: (1) results of the Simon et. al dataset reveals turbidity values in background receiving water in California's ecoregions range from 16 NTU to 1716 NTU (with a mean of 544 NTU); (2) based on a constructed 95% confidence interval, construction sites will be subject to administrative civil liability (ACL) when their turbidity measurement falls between 190.78 – 833.68 NTU; and (3) sites with highly controlled discharges employing and maintaining good erosion control practices can discharge effluent from the BMP with turbidity values less than 100 NTU. Therefore, the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality, and cost-effectiveness ranges from 100 NTU to over 1700 NTU. To keep this parameter and the costs of compliance as low as possible, State Water Board staff has determined, using its BPJ, that it is most cost effective to set the numeric effluent limitation for turbidity at 500 NTU.

a. **Compliance Storm Event**

In response to public comments on the last draft and the recommendations of the expert panel, this General Permit contains "compliance storm event" exceptions from the technology-based NELs. The rationale is that technology-based requirements are developed assuming a certain design storm (defined as the storm producing a rainfall amount for a specified BMPs capacity). Compliance thresholds are needed for storm events above and beyond the design storms assumed to determine the technology-based NELs. For Risk Level 3 project sites applicable to NELs, this General Permit establishes a compliance storm event as the equivalent rainfall in a 5-year, 24-hour storm. This compliance storm was chosen due to its relative infrequent occurrence and the fact that the runoff volume associated with it is not as large as a 10-year, 24-hour storm event. The discharger shall determine this value using Western Regional Climate Center Precipitation Frequency Maps[9] for 5-year 24-hour storm events in Northern and Southern California (note that these are expressed in tenths of inches – divide by 10 to get inches).

b. **TMDLs and Waste Load Allocations**

Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL for sediment has been adopted by the Regional Water Board or USEPA, must comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of sediment. If it does, the TMDL should include a specific waste load allocation for this activity/source. The discharger, in this case, may be required by a separate Regional Water Board order to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. If a specific waste load allocation has been established that would apply to a specific discharge, the Regional Water Board may adopt an order requiring specific implementation actions necessary to meet that allocation. In the instance where an approved TMDL has specified a general waste load allocation to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, dischargers must consult with the state TMDL authority[10] to confirm that adherence to a SWPPP that meets the requirements of the General Permit will be consistent with the approved TMDL.

2. **Determining Compliance with Effluent Standards**

a. **Technology-Based Numeric Action Levels (NALs)**

This General Permit contains technology-based NALs for pH and turbidity, and requirements for effluent monitoring at all Risk level 2 & 3, and LUP Type 2 & 3 sites. Numeric action levels are essentially numeric benchmark values for certain parameters that, if exceeded in effluent sampling, trigger the discharger to take actions. Exceedance of an NAL does not itself constitute a violation of the General Permit. If the discharger fails to take the corrective action required by the General Permit, though, that may consititute a violation.

The primary purpose of NALs is to assist dischargers in evaluating the effectiveness of their on-site measures. Construction sites need to employ many different systems that must work together to achieve compliance with the permit's requirements. The NALs chosen should indicate whether the systems are working as intended.

Another purpose of NALs is to provide information regarding construction activities and water quality impacts. This data will provide the State and Regional Water Boards and the rest of the storm water community with more information about levels and types of pollutants present in runoff and how effective the dischargers BMPs are at reducing pollutants in effluent. The State Water Board also hopes to learn more about the linkage between effluent and receiving water quality. In addition, these requirements will provide information on the mechanics needed to establish compliance monitoring programs at construction sites in future permit deliberations.

i. ***pH***

[9] http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif & http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif .
[10] http://www.waterboards.ca.gov/tmdl/tmdl.html.

The chosen limits were established by calculating one standard deviation above and below the mean pH of runoff from highway construction sites[11] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.5 to 8.5 pH Units.

The Caltrans study included 33 highway construction sites throughout California over a period of four years, which included 120 storm events. All of these sites had BMPs in place that would be generally implemented at all types of construction sites in California.

ii. ***Turbidity***

BPJ was used to develop an NAL that can be used as a learning tool to help dischargers improve their site controls, and to provide meaningful information on the effectiveness of storm water controls. A statewide turbidity NAL has been set at 250 NTU.

G. Receiving Water Limitations

Construction-related activities that cause or contribute to an exceedance of water quality standards must be addressed. The dynamic nature of construction activity gives the discharger the ability to quickly identify and monitor the source of the exceedances. This is because when storm water mobilizes sediment, it provides visual cues as to where corrective actions should take place and how effective they are once implemented.

This General Permit requires that storm water discharges and authorized non-storm water discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards. The monitoring requirements in this General Permit for sampling and analysis procedures will help determine whether BMPs installed and maintained are preventing pollutants in discharges from the construction site that may cause or contribute to an exceedance of water quality standards.

Water quality standards consist of designated beneficial uses of surface waters and the adoption of ambient criteria necessary to protect those uses. When adopted by the State Water Board or a Regional Water Board, the ambient criteria are termed “water quality objectives.” If storm water runoff from construction sites contains pollutants, there is a risk that those pollutants could enter surface waters and cause or contribute to an exceedance of water quality standards. For that reason, dischargers should be aware of the applicable water quality standards in their receiving waters. (The best method to ensure compliance with receiving water limitations is to implement BMPs that prevent pollutants from contact with storm water or from leaving the construction site in runoff.)

In California, water quality standards are published in the Basin Plans adopted by each Regional Water Board, the California Toxics Rule (CTR), the National Toxics Rule (NTR), and the Ocean Plan.

Dischargers can determine the applicable water quality standards by contacting Regional Water Board staff or by consulting one of the following sources. The actual Basin Plans that contain the water quality standards can be viewed at the website of the appropriate Regional Water Board. (http://www.waterboards.ca.gov/regions.html), the State Water Board site for statewide plans (http://www.waterboards.ca.gov/plnspols/index.html), or the USEPA regulations for the NTR and CTR (40 C.F.R. §§ 131.36-38). Basin Plans and statewide plans are also available by mail from the appropriate Regional Water Board or the State Water Board. The USEPA regulations are available at http://www.epa.gov/. Additional information concerning water quality standards can be accessed through http://www.waterboards.ca.gov/stormwtr/gen_const.html.

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[11] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.

H. Training Qualifications and Requirements

The Blue Ribbon Panel (BRP) made the following observation about the lack of industry-specific training requirements:

"Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors."

Order 99-08-DWQ required that all dischargers train their employees on how to comply with the permit, but it did not specificy a curriculum or certification program. This has resulted in inconsistent implementation by all affected parties - the dischargers, the local governments where the construction activity occurs, and the regulators required to enforce 99-08-DWQ. This General Permit requires Qualified SWPPP Developers and practitioners to obtain appropriate training, and makes this curriculum mandatory two years after adoption, to allow time for course completion. The State and Regional Water Board are working with many stakeholders to develop the curriculum and mechanisms needed to develop and deliver the courses.

To ensure that the preparation, implementation, and oversight of the SWPPP is sufficient for effective pollution prevention, the Qualified SWPPP Developer and Qualified SWPPP Practitioners responsible for creating, revising, overseeing, and implementing the SWPPP must attend a State Water Board-sponsored or approved Qualified SWPPP Developer and Qualified SWPPP Practitioner training course.

I. Sampling, Monitoring, Reporting and Record Keeping

1. Traditional Construction Monitoring Requirements

This General Permit requires visual monitoring at all sites, and effluent water quality at all Risk Level 2 & 3 sites. It requires receiving water monitoring at some Risk Level 3 sites. All sites are required to submit annual reports, which contain various types of information, depending on the site characteristics and events. A summary of the monitoring and reporting requirements is found in Table 4.

Table 4 - Required Monitoring Elements for Risk Levels

	Visual	Non-visible Pollutant	Effluent	Receiving Water
Risk Level 1	three types required for all Risk Levels: non-storm water, pre-rain and post-rain	As needed for all Risk Levels (see below)	where applicable	not required
Risk Level 2			pH, turbidity	not required
Risk Level 3			(if NEL exceeded) pH, turbidity and SSC	(if NEL exceeded) pH, turbidity and SSC. Bioassessment for sites 30 acres or larger.

a. Visual

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources. For storm-related inspections, dischargers must visually observe storm water discharges at all discharge locations within two business days after a qualifying event. For this requirement, a qualifying rain event is one producing precipitation of ½ inch or more of discharge. Dischargers must conduct a post-storm event inspection to

(1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify any additional BMPs necessary and revise the SWPPP accordingly. Dischargers must maintain on-site records of all visual observations, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

b. **Non-Visible Pollutant Monitoring**

This General Permit requires that all dischargers develop a sampling and analysis strategy for monitoring pollutants that are not visually detectable in storm water. Monitoring for non-visible pollutants must be required at any construction site when the exposure of construction materials occurs and where a discharge can cause or contribute to an exceedance of a water quality objective.

Of significant concern for construction discharges are the pollutants found in materials used in large quantities at construction sites throughout California and exposed throughout the rainy season, such as cement, flyash, and other recycled materials or by-products of combustion. The water quality standards that apply to these materials will depend on their composition. Some of the more common storm water pollutants from construction activity are not CTR pollutants. Examples of non-visible pollutants include glyphosate (herbicides), diazinon and chlorpyrifos (pesticides), nutrients (fertilizers), and molybdenum (lubricants). The use of diazinon and chlorpyrifos is a common practice among landscaping professionals and may trigger sampling and analysis requirements if these materials come into contact with storm water. High pH values from cement and gypsum, high pH and SSC from wash waters, and chemical/fecal contamination from portable toilets, also are not CTR pollutants. Although some of these constituents do have numeric water quality objectives in individual Basin Plans, many do not and are subject only to narrative water quality standards (i.e. not causing toxicity). Dischargers are encouraged to discuss these issues with Regional Water Board staff and other storm water quality professionals.

The most effective way to avoid the sampling and analysis requirements, and to ensure permit compliance, is to avoid the exposure of construction materials to precipitation and storm water runoff. Materials that are not exposed do not have the potential to enter storm water runoff, and therefore receiving waters sampling is not required. Preventing contact between storm water and construction materials is one of the most important BMPs at any construction site.

Preventing or eliminating the exposure of pollutants at construction sites is not always possible. Some materials, such as soil amendments, are designed to be used in a manner that will result in exposure to storm water. In these cases, it is important to make sure that these materials are applied according to the manufacturer's instructions and at a time when they are unlikely to be washed away. Other construction materials can be exposed when storage, waste disposal or the application of the material is done in a manner not protective of water quality. For these situations, sampling is required unless there is capture and containment of all storm water that has been exposed. In cases where construction materials may be exposed to storm water, but the storm water is contained and is not allowed to run off the site, sampling will only be required when inspections show that the containment failed or is breached, resulting in potential exposure or discharge to receiving waters.

The discharger must develop a list of potential pollutants based on a review of potential sources, which will include construction materials soil amendments, soil treatments, and historic contamination at the site. The discharger must review existing environmental and real estate documentation to determine the potential for pollutants that could be present on the construction site as a result of past land use activities.

Good sources of information on previously existing pollution and past land uses include:

i. Environmental Assessments;

ii. Initial Studies;

iii. Phase 1 Assessments prepared for property transfers; and

iv. Environmental Impact Reports or Environmental Impact Statements prepared under the requirements of the National Environmental Policy Act or the California Environmental Quality Act.

In some instances, the results of soil chemical analyses may be available and can provide additional information on potential contamination.

The potential pollutant list must include all non-visible pollutants that are known or should be known to occur on the construction site including, but not limited to, materials that:

i. are being used in construction activities;

ii. are stored on the construction site;

iii. were spilled during construction operations and not cleaned up;

iv. were stored (or used) in a manner that created the potential for a release of the materials during past land use activities;

v. were spilled during previous land use activities and not cleaned up; or

vi. were applied to the soil as part of past land use activities.

C. Effluent Monitoring

Federal regulations[12] require effluent monitoring for discharges subject to NALs and NELs. Subsequently, all Risk Level 2 and 3 dischargers must perform sampling and analysis of effluent discharges to characterize discharges associated with construction activity from the entire area disturbed by the project. Dischargers must collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

Table 5 - Storm Water Effluent Monitoring Requirements by Risk Level

	Frequency	Effluent Monitoring (Section E, below)
Risk Level 1	when applicable	non-visible pollutant parameters (if applicable)
Risk Level 2	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters (if applicable)
Risk Level 3	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	If NEL exceeded: pH, turbidity and suspended sediment concentration (SSC)., Plus non-visible pollutant parameters if applicable

Risk Level 1 dischargers must analyze samples for:

[12] 40 C.F.R. § 122.44.

i. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment C contained in the General Permit.

Risk Level 2 dischargers must analyze samples for:

i. pH and turbidity;
ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment D contained in the General Permit, and
iii. any additional parameters for which monitoring is required by the Regional Water Board.

Risk Level 3 dischargers must analyze samples for:

i. pH, turbidity and SSC;
ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment E contained in the General Permit, and
iii. any additional parameters for which monitoring is required by the Regional Water Board.

2. Linear Monitoring and Sampling Requirements

Attachment A, establishes minimum monitoring and reporting requirements for all LUPs. It establishes different monitoring requirements depending on project complexity and risk to water quality. The monitoring requirements for Type 1 LUPs are less than Type 2 & 3 projects because Type 1 projects have a lower potential to impact water quality.

A discharger shall prepare a monitoring program prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project.

a. Type 1 LUP Monitoring Requirements

A discharger must conduct daily visual inspections of Type 1 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be conducted in conjunction with other daily activities. Inspections will be conducted to ensure the BMPs are adequate, maintained, and in place at the end of the construction day. The discharger will revise the SWPPP, as appropriate, based on the results of the daily inspections. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures have been installed, and successful final vegetative cover or other stabilization criteria have been met).

A discharger shall implement the monitoring program for inspecting Type 1 LUPs. This program requires temporary and permanent stabilization BMPs after active construction is completed. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where re-vegetation is chosen until minimum vegetative coverage has been established. Photographs shall be taken during site inspections and submitted to the State Water Board.

b. Type 2 & 3 LUP Monitoring Requirements

A discharger must conduct daily visual inspections of Type 2 & 3 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be in conjunction with other daily activities.

All dischargers of Type 2 & 3 LUPs are required to conduct inspections by qualified personnel of the construction site during normal working hours prior to all anticipated storm events and after actual storm events. During extended storm events, the discharger shall conduct inspections during normal working hours for each 24-hour period. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures installed, and successful vegetative cover or other stabilization criteria have been met).

The goals of these inspections are (1) to identify areas contributing to a storm water discharge; (2) to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly installed and functioning in accordance with the terms of the General Permit; and (3) to determine whether additional control practices or corrective maintenance activities are needed. Equipment, materials, and workers must be available for rapid response to failures and emergencies. All corrective maintenance to BMPs shall be performed as soon as possible, depending upon worker safety.

All dischargers shall develop and implement a monitoring program for inspecting Type 2 & 3 LUPs that require temporary and permanent stabilization BMPs after active construction is completed. Inspections will be conducted to ensure the BMPs are adequate and maintained. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where revegetation is chosen until minimum vegetative coverage has been established.

A log of inspections conducted before, during, and after the storm events must be maintained in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection. Photographs must be taken during site inspections and submitted to the State Water Board.

c. Sampling Requirements for all LUP Project Types

LUPs are also subject to sampling and analysis requirements for visible pollutants (i.e., sedimentation/siltation, turbidity) and for non-visible pollutants.

Sampling for visible pollutants is required for Type 2 & 3 LUPs.

Non-visible pollutant monitoring is required for pollutants associated with construction sites and activities that (1) are not visually detectable in storm water discharges, and (2) are known or should be known to occur on the construction site, and (3) could cause or contribute to an exceedance of water quality objectives in the receiving waters. Sample collection for non-visible pollutants must only be required (1) during a storm event when pollutants associated with construction activities may be discharged with storm water runoff due to a spill, or in the event there was a breach, malfunction, failure, and/or leak of any BMP, and (2) when the discharger has failed to adequately clean the area of material and pollutants. Failure to implement appropriate BMPs will trigger the same sampling requirements as those required for a breach, malfunction and/or leak, or when the discharger has failed to implement appropriate BMPs prior to the next storm event.

Additional monitoring parameters may be required by the Regional Water Boards.

It is not anticipated that many LUPs will be required to collect samples for pollutants not visually detected in runoff due to the nature and character of the construction site and activities as previously described in this fact sheet. Most LUPs are constructed in urban areas with public access (e.g., existing roadways, road shoulders, parking areas, etc.). This raises a concern regarding the potential contribution of pollutants from vehicle use and/or from normal activities of the public (e.g., vehicle washing, landscape fertilization, pest spraying, etc.) in runoff from the project site. Since the dischargers are not the land owners of the project area and are not able to control the presence of these pollutants in the storm water that runs through their projects, it is not the intent of this General Permit to require dischargers to sample for these pollutants. This General Permit does not require the discharger to sample for these types of pollutants except where the discharger has brought materials onsite that contain these pollutants and when a condition (e.g., breach, failure, etc.) described above occurs.

3. Receiving Water Monitoring

In order to ensure that receiving water limitations are met, discharges subject to numeric effluent limitations (i.e., Risk Level 3, LUP Type 3, and ATS with direct discharges into receiving waters) must also monitor the downstream receiving water(s) for turbidity, SSC, and pH (if applicable) when an NEL is exceeded.

a. Bioassessment Monitoring

This General Permit requires a bioassessment of receiving waters for dischargers of Risk Level 3 or LUP Type 3 construction projects equal to or larger than 30 acres with direct discharges into receiving waters. Benthic macroinvertebrate samples will be taken upstream and downstream of the site's discharge point in the receiving water. Bioassessments measure the quality of the stream by analyzing the aquatic life present. Higher levels of appropriate aquatic species tend to indicate a healthy stream; whereas low levels of organisms can indicate stream degradation. Active construction sites have the potential to discharge large amounts of sediment and pollutants into receiving waters. Requiring a bioassessment for large project sites, with the most potential to impact water quality, provides a snapshot of the health of the receiving water prior to initiation of construction activities. This snapshot can be used in comparison to the health of the receiving water after construction has commenced.

Each ecoregion (biologically and geographically related area) in the State has a specific yearly peak time where stream biota is in a stable and abundant state. This time of year is called an Index Period. The bioassessment requirements in this General Permit, requires benthic macroinvertebrate sampling within a sites index period. The State Water Board has developed a map designating index periods for the ecoregions in the State (see State Water Board Website).

This General Permit requires the bioassessment methods to be in accordance with the Surface Water Ambient Monitoring Program (SWAMP) in order to provide data consistency within the state as well as generate useable biological stream data.

Table 6 - Receiving Water Monitoring Requirements

	Receiving Water Monitoring Parameters
Risk Level 1 /LUP Type 1	not required
Risk Level 2 / LUP Type 2	not required
Risk Level 3 / LUP Type 3	If NEL exceeded: pH (if applicable), turbidity, and SSC. Bioassessment for sites 30 acres or larger.

4. Reporting Requirements

a. NEL Violation Report

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards, via SMARTS, no later than 5 days after the conclusion of the storm event. The purpose of the electronic filing of the NEL Violation Report is to 1) inform stakeholder agencies and organizations and the general public, and 2) notify the State and Regional Water Boards of the exceedance so that they can determine whether any follow-up (e.g., inspection, enforcement, etc.) is necessary to bring the site into compliance.

In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, Risk level 3/LUP Type 3 dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification. Specifically, the NEL Exceedance Report is required to contain:

- the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit are to be reported as "less than the method detection limit or <MDL");
- the date, place, and time of sampling;
- any visual observation (inspections);
- any measurements, including precipitation; and
- a description of the current BMPs associated with the effluent sample that exceeded the NEL and any proposed corrective actions taken.

b. **NAL Exceedance Report**

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards, via the electronic data system, no later than 5 days after the conclusion of the storm event. In the event that any effluent sample exceeds an applicable NAL, all Risk Level 2 and LUP Type 2 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards no later than 10 days after the conclusion of the storm event. The Regional Water Boards have the authority to require the submittal of an NAL Exceedance Report.

Specifically, the NAL Exceedance Report is required to contain:

- the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit are to be reported as "less than the method detection limit or <MDL");
- the date, place, and time of sampling;
- any visual observation (inspections);
- any measurements, including precipitation; and
- a description of the current BMPs associated with the effluent sample that exceeded the NAL and any proposed corrective actions taken.

c. **Annual Report**

All dischargers must prepare and electronically submit an annual report no later than September 1 of each year using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.

5. Record Keeping

According to 40 C.F.R. Parts 122.21(p) and 122.41(j), the discharger is required to retain paper or electronic copies of all records required by this General Permit for a period of at least three years from the date generated or the date submitted to the State Water Board or Regional Water Boards. A discharger must retain records for a period beyond three years as directed by Regional Water Board.

J. Risk Determination

1. Traditional Projects

a. Overall Risk Determination

There are two major requirements related to site planning and risk determination in this General Permit. The project's overall risk is broken up into two elements – (1) project sediment risk (the relative amount of sediment that can be discharged, given the project and location details) and (2) receiving water risk (the risk sediment discharges pose to the receiving waters).

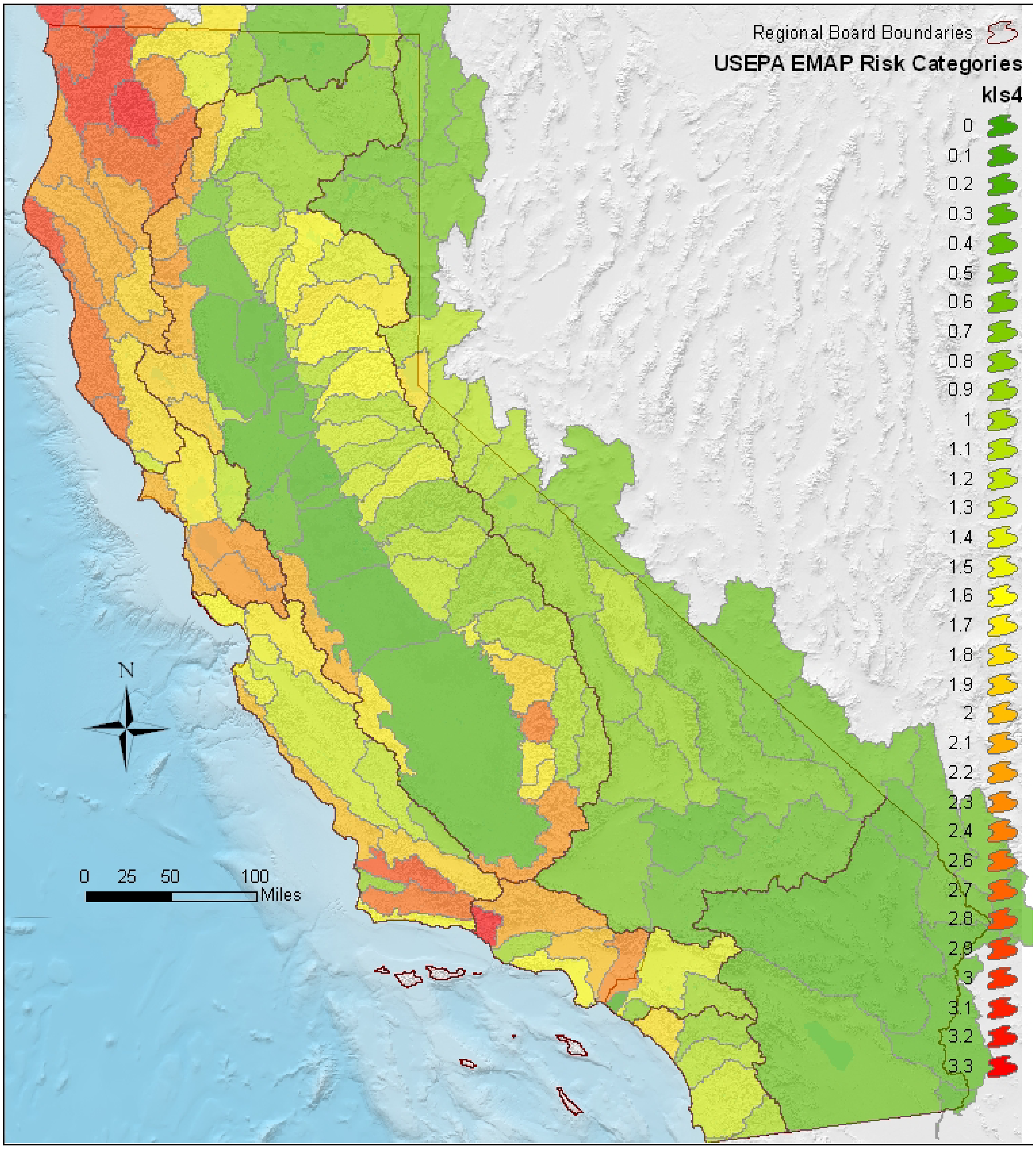
Project Sediment Risk:
Project Sediment Risk is determined by multiplying the R, K, and LS factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss expressed in tons/acre. The RUSLE equation is as follows:

A = (R)(K)(LS)(C)(P)

Where: A = the rate of sheet and rill erosion
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor (erosion controls)
P = management operations and support practices (sediment controls)

The C and P factors are given values of 1.0 to simulate bare ground conditions.

There is a map option and a manual calculation option for determining soil loss. For the map option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The product of K and LS are shown on Figure 1. To determine soil loss in tons per acre, the discharger multiplies the R factor times the value for K times LS from the map.



Water Boards

State Water Resources Control Board, January 15, 2008

Figure 1 -Statewide Map of K * LS

For the manual calculation option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The K and LS factors are determined using Appendix 1.

Soil loss of less than 15 tons/acre is considered **low** sediment risk.
Soil loss between 15 and 75 tons/acre is **medium** sediment risk.
Soil loss over 75 tons/acre is considered **high** sediment risk.

The soil loss values and risk categories were obtained from mean and standard deviation RKLS values from the USEPA EMAP program. High risk is the mean RKLS value plus two standard deviations. Low risk is the mean RKLS value minus two standard deviations.

Receiving Water Risk:
Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either

on the most recent 303d list for waterbodies impaired for sediment;
has a USEPA-approved Total Maximum Daily Load implementation plan for sediment; **or**
has the beneficial uses of COLD, SPAWN, and MIGRATORY.

A project that meets at least one of the three criteria has a high receiving water risk. A list of sediment-sensitive waterbodies will be posted on the State Water Board's website. It is anticipated that an interactive map of sediment sensitive water bodies in California will be available in the future.

The Risk Levels have been altered by eliminating the possibility of a Risk Level 4, and expanding the constraints for Risk Levels 1, 2, and 3. Therefore, projects with high receiving water risk and high sediment risk will be considered a Risk Level 3 risk to water quality.

In response to public comments, the Risk Level requirements have also been changed such that Risk Level 1 projects will be subject to minimum BMP and visual monitoring requirements, Risk Level 2 projects will be subject to NALs and some additional monitoring requirements, and Risk Level 3 projects will be subject to NELs, and more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment.

Table 7 - Combined Risk Level Matrix

Combined Risk Level Matrix				
Receiving Water Risk		Sediment Risk		
		Low Medium		High
	Low	Level 1	Level 2	
	High	Level 2		Level 3

b. **Effluent Standards**

All dischargers are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require storm water discharges associated with construction activity to meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize BAT and BCT to reduce pollutants and any more stringent controls necessary to meet water quality standards.

Risk Level 2, and 3 dischargers are subject to numeric effluent standards comparable to the project's risk to water quality. Risk Level 2 dischargers that pose a medium risk to water quality are subject to technology-based NALs for pH and turbidity. Risk Level 3 dischargers that pose a high risk to water quality are subject to technology-based NALs and technology-based NELs for pH and turbidity.

c. Good Housekeeping

Proper handling and managing of construction materials can help minimize threats to water quality. The discharger must consider good housekeeping measures for: construction materials, waste management, vehicle storage & maintenance, landscape materials, and potential pollutant sources. Examples include; conducting an inventory of products used, implementing proper storage & containment, and properly cleaning all leaks from equipment and vehicles.

d. Non-Storm Water Management

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and from dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

e. Erosion Control

The best way to minimize the risk of creating erosion and sedimentation problems during construction is to disturb as little of the land surface as possible by fitting the development to the terrain. When development is tailored to the natural contours of the land, little grading is necessary and, consequently, erosion potential is lower.[14] Other effective erosion control measures include: preserving existing vegetation where feasible, limiting disturbance, and stabilizing and re-vegetating disturbed areas as soon as possible after grading or construction activities. Particular attention must be paid to large, mass-graded sites where the potential for soil exposure to the erosive effects of rainfall and wind is great and where there is potential for significant sediment discharge from the site to surface waters. Until permanent vegetation is established, soil cover is the most cost-effective and expeditious method to protect soil particles from detachment and transport by rainfall. Temporary soil stabilization can be the single most important factor in reducing erosion at construction sites. The discharger is required to consider measures such as: covering disturbed areas with mulch, temporary seeding, soil stabilizers, binders, fiber rolls or blankets, temporary vegetation, and permanent seeding. These erosion control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed. Erosion control BMPs should be the primary means of preventing storm water contamination, and sediment control techniques should be used to capture any soil that becomes eroded.[13]

Risk Level 3 dischargers pose a higher risk to water quality and are therefore additionally required to ensure that post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Sediment Control

Sediment control BMPs should be the secondary means of preventing storm water contamination. When erosion control techniques are ineffective, sediment control techniques should be used to capture any soil that becomes eroded. The discharger is required to consider perimeter control measures such as: installing silt fences or placing straw wattles below slopes. These sediment control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed.

Because Risk Level 2 and 3 dischargers pose a higher risk to water quality, additional requirements for the application of sediment controls are imposed on these projects. This General Permit also authorizes the Regional Water Boards to require Risk Level 3 dischargers to implement additional site-specific

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[13] U.S. Environmental Protection Agency. 2007. Developing Your Storm Water Pollution Prevention Plan: A Guide for Construction Sites.

sediment control requirements if the implementation of other erosion or sediment controls are not adequately protecting the receiving waters.

g. **Run-on and Runoff Control**

Inappropriate management of run-on and runoff can result in excessive physical impacts to receiving waters from sediment and increased flows. The discharger is required to manage all run-on and runoff from a project site. Examples include: installing berms and other temporary run-on and runoff diversions.

Risk Level 1 dischargers with lower risks to impact water quality are not subject to the run-on and runoff control requirements unless an evaluation deems them necessary or visual inspections show that such controls are required.

h. **Inspection, Maintenance and Repair**

All measures must be periodically inspected, maintained and repaired to ensure that receiving water quality is protected. Frequent inspections coupled with thorough documentation and timely repair is necessary to ensure that all measures are functioning as intended.

i. **Rain Event Action Plan (REAP)**

A Rain Event Action Plan (REAP) is a written document, specific for each rain event. A REAP should be designed that when implemented it protects all exposed portions of the site within 48 hours of any likely precipitation event forecast of 50% or greater probability.

This General Permit requires Risk Level 2 and 3 dischargers to develop and implement a REAP designed to protect all exposed portions of their sites within 48 hours prior to any likely precipitation event. The REAP requirement is designed to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants generated from the active site. A REAP must be developed when there is likely a forecast of 50% or greater probability of precipitation in the project area. (The National Oceanic and Atmospheric Administration (NOAA) defines a chance of precipitation as a probability of precipitation of 30% to 50% chance of producing precipitation in the project area.[14] NOAA defines the probability of precipitation (PoP) as the likelihood of occurrence (expressed as a percent) of a measurable amount (0.01 inch or more) of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area.) Forecasts are normally issued for 12-hour time periods. Descriptive terms for uncertainty and aerial coverage are used as follows:

Table 8 -National Oceanic and Atmospheric Administration (NOAA) Definition of Probability of Precipitation (PoP)

PoP	Expressions of Uncertainty	Aerial Coverage
0%	none used	none used
10%	none used	isolated
20%	slight chance	isolated
30-50%	chance	scattered

[14] http://www.crh.noaa.gov/lot/severe/wxterms.php.

60-70%	likely	numerous
80-100%	none used	none used

The discharger must obtain the precipitation forecast information from the National Weather Service Forecast Office (http://www.srh.noaa.gov/).

2. Linear Projects

a. Linear Risk Determination

LUPs vary in complexity and water quality concerns based on the type of project. This General Permit has varying application requirements based on the project's risk to water quality. Factors that lead to the characterization of the project include location, sediment risk, and receiving water risk.

Based on the location and complexity of a project area or project section area, LUPs are separated into project types. As described below, LUPs have been categorized into three project types.

i. *Type 1 LUPs*

Type 1 LUPs are those construction projects where:

(1) 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day, or

(2) greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

Areas disturbed during construction will be returned to pre-construction conditions or equivalent protection established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization Best Management Practices (BMPs) will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

Type 1 LUPs typically do not have a high potential to impact storm water quality because (1) these construction activities are not typically conducted during a rain event, (2) these projects are normally constructed over a short period of time[15], minimizing the duration that pollutants could potentially be exposed to rainfall; and (3) disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.

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[15] Short period of time refers to a project duration of weeks to months, but typically less than one year in duration.

Type 1 LUPs are determined during the risk assessment found in Attachment A.1 to be 1) low sediment risk and low receiving water risk; 2) low sediment risk and medium receiving water risk; and 3) medium sediment risk and low receiving water risk.

This General Permit requires the discharger to ensure a SWPPP is developed for these construction activities that is specific to project type, location and characteristics.

ii. ***Type 2 LUPs:***

Type 2 projects are determined to have a combination of High, Medium, and Low project sediment risk along with High, Medium, and Low receiving water risk. Like Type 1 projects, Type 2 projects are typically constructed over a short period of time. However, these projects have a higher potential to impact water quality because they:

(1) typically occur outside the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location and characteristics.

iii. ***Type 3 LUPs:***

Type 3 projects are determined to have a combination of High and Medium project sediment risk along with High and Medium receiving water risk. Similar to Type 2 projects, Type 3 projects have a higher potential to impact water quality because they:

(1) typically occur outside of the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location, and characteristics.

b. **Linear Effluent Standards**

All LUPs are subject to the narrative effluent limitations specified in the General Permit.

Type 2 and 3 LUPs are subject to NELs comparable to the project type's risk to water quality. Type 2 projects that pose an intermediate risk to water quality are subject to technology-based NALs for pH and turbidity. Type 3 projects posing a high risk to water quality are subject to technology-based NALs and NELs for pH and turbidity.

c. **Linear Good Housekeeping**

Improper use and handling of construction materials could potentially cause a threat to water quality. In order to ensure proper site management of these construction materials, all LUP dischargers must comply with a minimum set of Good Housekeeping measures specified in Attachment A of this General Permit.

d. **Linear Non-Storm Water Management**

In order to ensure control of all non-storm water discharges during construction, all LUP dischargers must comply with the Non-Storm Water Management measures specified in Attachment A of this General Permit.

e. **Linear Erosion Control**

This General Permit requires all LUP dischargers to implement effective wind erosion control measures, and soil cover for inactive areas. Type 3 LUPs posing a higher risk to water quality are additionally required to ensure the post-construction soil loss is equivalent to or less than the pre-construction levels.

f. **Linear Sediment Control**

In order to ensure control and containment of all sediment discharges, all LUP dischargers must comply with the general Sediment Control measures specified in Attachment A or this General Permit. Additional requirements for sediment controls are imposed on Type 2 & 3 LUPs due to their higher risk to water quality.

g. **Linear Run-on and Runoff Control**

Discharges originating outside of a project's perimeter and flowing onto the property can adversely affect the quantity and quality of discharges originating from a project site. In order to ensure proper management of run-on and runoff, all LUPs must comply with the run-on and runoff control measures specified in Attachment A of this General Permit. Due to the lower risk of impacting water quality, Type 1 LUPs are not required to implement run-on and runoff controls unless deemed necessary by the discharger.

h. **Linear Inspection, Maintenance and Repair**

Proper inspection, maintenance, and repair activities are important to ensure the effectiveness of on-site measures to control water quality. In order to ensure that inspection, maintenance, and repair activities are adequately performed, the all LUP dischargers a re required to comply with the Inspection, Maintenance, and Repair requirements specified in Attachment A of this General Permit.

K. ATS[16] Requirements

There are instances on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion. Under such circumstances, or under circumstances where storm water discharges leaving the site may cause or contribute to an exceedance of a water quality standard, the use of an Active Treatment System (ATS) may be necessary. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.[17]

Although treatment systems have been in use in some form since the mid-1990s, the ATS industry in California is relatively young, and detailed regulatory standards have not yet been developed. Many developers are using these systems to treat storm water discharges from their construction sites. The new ATS requirements set forth in this General Permit are based on those in place for small wastewater treatment systems, ATS regulations from the Central Valley Regional Water Quality Control Board (September 2005 memorandum “2005/2006 Rainy Season – Monitoring Requirements for Storm Water Treatment Systems that Utilize Chemical Additives to Enhance Sedimentation”), the Construction Storm Water Program at the State of Washington’s Department of Ecology, as well as recent advances in technology and knowledge of coagulant performance and aquatic safety.

The effective design of an ATS requires a detailed survey and analysis of site conditions. With proper planning, ATS performance can provide exceptional water quality discharge and prevent significant impacts to surface water quality, even under extreme environmental conditions.

These systems can be very effective in reducing the sediment in storm water runoff, but the systems that use additives/polymers to enhance sedimentation also pose a potential risk to water quality (e.g., operational failure, equipment failure, additive/polymer release, etc.). The State Water Board is concerned about the potential acute and chronic impacts that the polymers and other chemical additives may have on fish and aquatic organisms if released in sufficient quantities or concentrations. In addition to anecdotal evidence of polymer releases causing aquatic toxicity in California, the literature supports this concern.[18] For example, cationic polymers have been shown to bind with the negatively charged gills of fish, resulting in mechanical suffocation.[19] Due to the potential toxicity impacts, which may be caused by the release of additives/polymers into receiving waters, this General Permit establishes residual polymer monitoring and toxicity testing requirements have been established in this General Permit for discharges from construction sites that utilize an ATS in order to protect receiving water quality and beneficial uses.

The primary treatment process in an ATS is coagulation/flocculation. ATS’s operate on the principle that the added coagulant is bound to suspended sediment, forming floc, which is gravitationally settled in tanks or a basin, or removed by sand filters. A typical installation utilizes an injection pump upstream from the clarifier tank, basin, or sand filters, which is electronically metered to both flow rate and suspended solids level of the influent, assuring a constant dose. The coagulant mixes and reacts with the influent, forming a dense floc. The floc may be removed by gravitational setting in a clarifier tank or basin, or by filtration. Water from the clarifier tank, basin, or sand filters may be routed through cartridge(s) and/or bag filters for final polishing. Vendor-specific systems use various methods of dose control, sediment/floc removal, filtration, etc., that are detailed in project-specific documentation. The

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[16] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation in order to reduce turbidity caused by fine suspended sediment.
[17] Pitt, R., S. Clark, and D. Lake. 2006. Construction Site Erosion and Sediment Controls: Planning, Design, and Performance. DEStech Publications. Lancaster, PA. 370pp.
[18] RomØen, K., B. Thu, and Ø. Evensen. 2002. Immersion delivery of plasmid DNA II. A study of the potentials of a chitosan based delivery system in rainbow trout (*Oncorhynchus mykiss*) fry. *Journal of Controlled Release* **85**: 215-225.
[19] Bullock, G., V. Blazer, S. Tsukuda, and S. Summerfelt. 2000. Toxicity of acidified chitosan for cultured rainbow trout (*Oncorhynchus mykiss*). *Aquaculture* **185**:273-280.

particular coagulant/flocculant to be used for a given project is determined based on the water chemistry of the site because the coagulants are specific in their reactions with various types of sediments. Appropriate selection of dosage must be carefully matched to the characteristics of each site.

ATS's are operated in two differing modes, either Batch or Flow-Through. Batch treatment can be defined as Pump-Treat-Hold-Test-Release. In Batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. Batch treatment involves holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full. In Flow-Through treatment, water is pumped into the ATS directly from the runoff collection system or storm water holding pond, where it is treated and filtered as it flows through the system, and is then directly discharged. "Flow-Through Treatment" is also referred to as "Continuous Treatment."

1. Effluent Standards

This General Permit establishes NELs for discharges from construction sites that utilize an ATS. These systems lend themselves to NELs for turbidity and pH because of their known reliable treatment. Advanced systems have been in use in some form since the mid-1990s. An ATS is considered reliable, can consistently produce a discharge of less than 10 NTU, and has been used successfully at many sites in several states since 1995 to reduce turbidity to very low levels.[20]

This General Permit contains "compliance storm event" exceptions from the technology-based NELs for ATS discharges. The rationale is that technology-based requirements are developed assuming a certain design storm. In the case of ATS the industry-standard design storm is 10-year, 24-hour (as stated in Attachment F of this General Permit), so the compliance storm event has been established as the 10-year 24-hour event as well to provide consistency.

2. Training

Operator training is critical to the safe and efficient operation and maintenance of the ATS, and to ensure that all State Water Board monitoring and sampling requirements are met. The General Permit requires that all ATS operators have training specific to using ATS's liquid coagulants.

L. Post-Construction Requirements

Under past practices, new and redevelopment construction activities have resulted in modified natural watershed and stream processes. This is caused by altering the terrain, modifying the vegetation and soil characteristics, introducing impervious surfaces such as pavement and buildings, increasing drainage density through pipes and channels, and altering the condition of stream channels through straightening, deepening, and armoring. These changes result in a drainage system where sediment transport capacity is increased and sediment supply is decreased. A receiving channel's response is dependent on dominant channel materials and its stage of adjustment.

Construction activity can lead to impairment of beneficial uses in two main ways. First, during the actual construction process, storm water discharges can negatively affect the chemical, biological, and physical properties of downstream receiving waters. Due to the disturbance of the landscape, the most likely pollutant is sediment, however pH and other non-visible pollutants are also of great concern. Second, after most construction activities are completed at a construction site, the finished project may result in significant modification of the site's response to precipitation. New development and redevelopment

[20] Currier, B., G. Minton, R. Pitt, L. Roesner, K. Schiff, M. Stenstrom, E. Strassler, and E. Strecker. 2006. The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities.

projects have almost always resulted in permanent post-construction water quality impacts because more precipitation ends up as runoff and less precipitation is intercepted, evapotranspired, and infiltrated.

General Permit 99-08-DWQ required the SWPPP to include a description of all post-construction BMPs on a site and a maintenance schedule. An effective storm water management strategy must address the full suite of storm events (water quality, channel protection, overbank flood protection, extreme flood protection) (Figure 2).

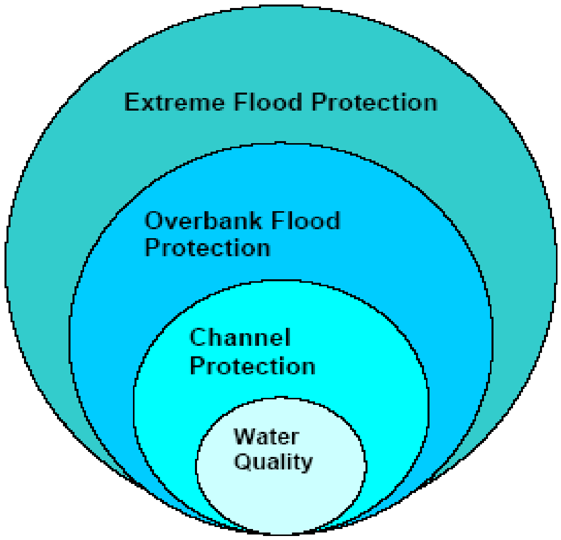

Figure 2 - Suite of Storm Events

The post-construction storm water performance standards in this General Permit specifically address water quality and channel protection events. Overbank flood protection and extreme flood protection events are traditionally dealt with in local drainage and flood protection ordinances. However, measures in this General Permit to address water quality and channel protection also reduce overbank and extreme flooding impacts. This General Permit aims to match post-construction runoff to pre-construction runoff for the 85th percentile storm event, which not only reduces the risk of impact to the receiving water's channel morphology but also provides some protection of water quality.

This General Permit clarifies that its runoff reduction requirements only apply to projects that lie outside of jurisdictions covered by a Standard Urban Storm water Management Plan (SUSMP) (or other more protective) post-construction requirements in either Phase I or Phase II permits.

Figures 3 and 4, below, show the General Permit enrollees (to Order 99-08-DWQ, as of March 10, 2008) overlaid upon a map with SUSMP (or more protective) areas in blue and purple. Areas without blue or purple indicate where the General Permit's runoff reduction requirements would actually apply.

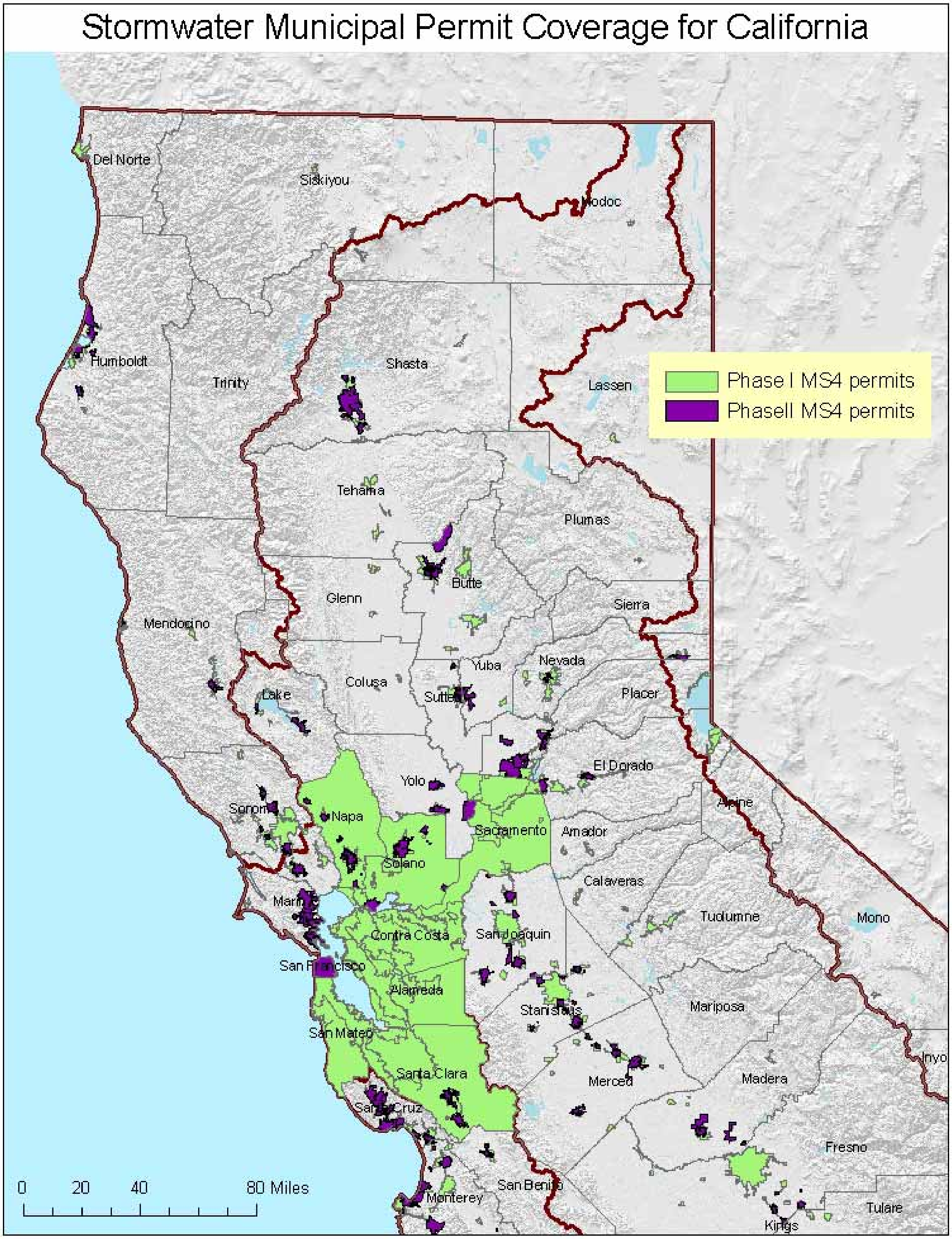

Figure 3 - Northern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Figure 4 - Southern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Water Quality:
This General Permit requires dischargers to replicate the pre-project runoff water balance (defined as the amount of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event, or the smallest storm event that generates runoff, whichever is larger. Contemporary storm water management generally routes these flows directly to the drainage system, increasing pollutant loads and potentially causing adverse effects on receiving waters. These smaller water quality events happen much more frequently than larger events and generate much higher pollutant loads on an annual basis. There are other adverse hydrological impacts that result from not designing according to the site's pre-construction water balance. In Maryland, Klein[21] noted that baseflow decreases as the extent of urbanization increases. Ferguson and Suckling[22] noted a similar relation in watersheds in Georgia. On Long Island, Spinello and Simmons[23] noted substantial decreases in base flow in intensely urbanized watersheds.

The permit emphasizes runoff reduction through on-site storm water reuse, interception, evapo-transpiration and infiltration through non-structural controls and conservation design measures (e.g., downspout disconnection, soil quality preservation/enhancement, interceptor trees). Employing these measures close to the source of runoff generation is the easiest and most cost-effective way to comply with the pre-construction water balance standard. Using low-tech runoff reduction techniques close to the source is consistent with a number of recommendations in the literature.[24] In many cases, BMPs implemented close to the source of runoff generation cost less than end-of the pipe measures.[25] Dischargers are given the option of using Appendix 2 to calculate the required runoff volume or a watershed process-based, continuous simulation model such as the EPA's Storm Water Management Model (SWMMM) or Hydrologic Simulation Program Fortran (HSPF). Such methods used by the discharger will be reviewed by the Regional Water Board upon NOT application.

Channel Protection:
In order to address channel protection, a basic understanding of fluvial geomorphic concepts is necessary. A dominant paradigm in fluvial geomorphology holds that streams adjust their channel dimensions (width and depth) in response to long-term changes in sediment supply and bankfull discharge (1.5 to 2 year recurrence interval). The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which the moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.[26] Lane (1955 as cited in Rosgen 1996[27]) showed the generalized relationship between sediment load, sediment size, stream discharge and stream slope in Figure 5. A change in any one of these variables sets up a series of mutual adjustments in the companion variables with a resulting direct change in the physical characteristics of the stream channel.

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[21] Klein 1979 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[22] Ferguson and Suckling 1990 as cited Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[23] Center for Watershed Protection (CWP). 2000. The Practice of Watershed Protection: Techniques for protecting our nation's streams, lakes, rivers, and estuaries. Ellicott City, MD. 741 pp.
[24] Bay Area Storm Water Management Agencies Association (BASMAA). 1997. Start at the Source: Residential Site Planning and Design Guidance Manual for Storm Water Quality Protection. Palo Alto, CA;
McCuen, R.H. 2003 Smart Growth: hydrologic perspective. Journal of Professional Issues in Engineering Education and Practice. Vol (129), pp.151-154;
Moglen, G.E. and S. Kim. 2007. Impervious imperviousness-are threshold based policies a good idea? Journal of the American Planning Association, Vol 73 No. 2. pp 161-171.
[25] Delaware Department of natural Resources (DDNR). 2004. Green technology: The Delaware urban Runoff Management Approcah. Dover, DE. 117 pp.
[26] Dunne, T and L.B. Leopold. 1978. Water in Environmental Planning. San Francisco W.H. Freeman and Company
[27] Rosgen. D.L. 1996. Applied River Morphology. Pagosa Springs. Wildland Hydrology

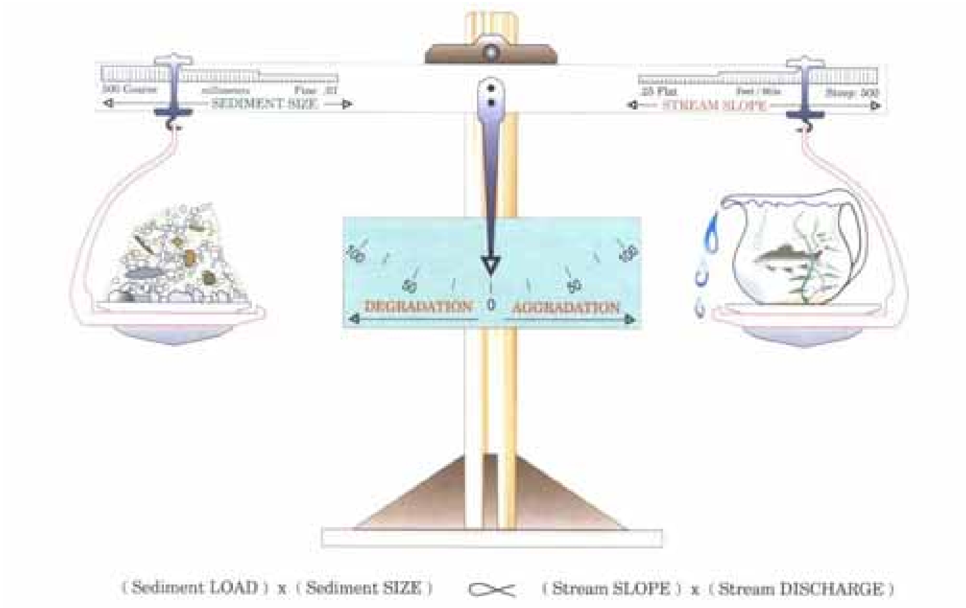

Figure 5 - Schematic of the Lane Relationship

After Lane (1955) as cited in Rosgen (1996)

Stream slope multiplied by stream discharge (the right side of the scale) is essentially an approximation of stream power, a unifying concept in fluvial geomorphology (Bledsoe 1999). Urbanization generally increases stream power and affects the resisting forces in a channel (sediment load and sediment size represented on the left side of the scale).

During construction, sediment loads can increase from 2 to 40,000 times over pre-construction levels.[28] Most of this sediment is delivered to stream channels during large, episodic rain events.[29] This increased sediment load leads to an initial aggradation phase where stream depths may decrease as sediment fills the channel, leading to a decrease in channel capacity and increase in flooding and overbank deposition. A degradation phase initiates after construction is completed.

Schumm et. al (1984) developed a channel evolution model that describes the series of adjustments from initial downcutting, to widening, to establishing new floodplains at lower elevations (Figure 6).

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[28] Goldman S.J., K. Jackson, and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw Hill. San Francisco.
[29] Wolman 1967 as cited in Paul, M.P. and J.L. Meyer. 2001. Streams in the Urban Landscape. *Annu. Rev.Ecol. Syst.* 32: 333-365.

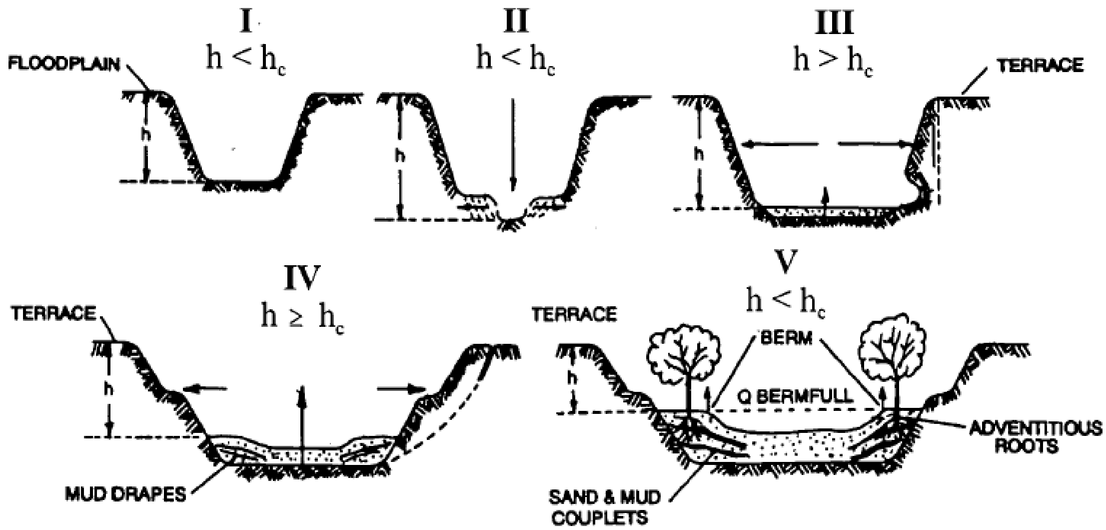

Figure 6 - Channel Changes Associated with Urbanization

After Incised Channel Evolution Sequence in Schumm et. al 1984

Channel incision (Stage II) and widening (Stages III and to a lesser degree, Stage IV) are due to a number of fundamental changes on the landscape. Connected impervious area and compaction of pervious surfaces increase the frequency and volume of bankfull discharges.[30] Increased drainage density (miles of stream length per square mile of watershed) also negatively impacts receiving stream channels.[31] Increased drainage density and hydraulic efficiency leads to an increase in the frequency and volume of bankfull discharges because the time of concentration is shortened. Flows from engineered pipes and channels are also often "sediment starved" and seek to replenish their sediment supply from the channel.

Encroachment of stream channels can also lead to an increase in stream slope, which leads to an increase in stream power. In addition, watershed sediment loads and sediment size (with size generally represented as the median bed and bank particle size, or d_{50}) decrease during urbanization.[32] This means that even if pre- and post-development stream power are the same, more erosion will occur in the post-development stage because the smaller particles are less resistant (provided they are non-cohesive).

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[30] Booth, D. B. and C. R. Jackson. 1997. Urbanization of Aquatic Systems: Degradation Thresholds, Storm Water Detection, and the Limits of Mitigation. Journal of the American Water Resources Association Vol. 33, No.5, pp. 1077-1089.

[31] May, C.W. 1998. Cumulative effects of urbanization on small streams in the Puget Sound Lowland ecoregion. Conference proceedings from Puget Sound Research '98 held March 12, 13 1998 in Seattle, WA;
Santa Clara Valley Urban Runoff Pollution Prevention Program. 2002. Hydromodification Management Plan Literature Review. 80 pp.

[32] Finkenbine, J.K., D.S. Atwater, and D.S. Mavinic. 2000. Stream health after urbanization. *J. Am. Water Resour. Assoc.* 36:1149-60;
Pizzuto, J.E. W.S. Hession, and M. McBride. 2000. Comparing gravel-bed rivers in paired urban and rural catchments of southeastern Pennsylvania. *Geology* 28:79-82.

As shown in Stages II and III, the channel deepens and widens to accommodate the increased stream power [33]and decrease in sediment load and sediment size. Channels may actually narrow as entrained sediment from incision is deposited laterally in the channel. After incised channels begin to migrate laterally (Stage III), bank erosion begins, which leads to general channel widening.[34] At this point, a majority of the sediment that leaves a drainage area comes from within the channel, as opposed to the background and construction related hillslope contribution. Stage IV is characterized by more aggradation and localized bank instability. Stage V represents a new quasi-equilibrium channel morphology in balance with the new flow and sediment supply regime. In other words, stream power is in balance with sediment load and sediment size.

The magnitude of the channel morphology changes discussed above varies along a stream network as well as with the age of development, slope, geology (sand-bedded channels may cycle through the evolution sequence in a matter of decades whereas clay-dominated channels may take much longer), watershed sediment load and size, type of urbanization, and land use history. It is also dependent on a channel's stage in the channel evolution sequence when urbanization occurs. Management strategies must take into account a channel's stage of adjustment and account for future changes in the evolution of channel form (Stein and Zaleski 2005).[35]

Traditional structural water quality BMPs (e.g. detention basins and other devices used to store volumes of runoff) unless they are highly engineered to provide adequate flow duration control, do not adequately protect receiving waters from accelerated channel bed and bank erosion, do not address post-development increases in runoff volume, and do not mitigate the decline in benthic macroinvertebrate communities in the receiving waters[36] suggest that structural BMPs are not as effective in protecting aquatic communities as a continuous riparian buffer of native vegetation. This is supported by the findings of Zucker and White[37], where instream biological metrics were correlated with the extent of forested buffers.

This General Permit requires dischargers to maintain pre-development drainage densities and times of concentration in order to protect channels and encourages dischargers to implement setbacks to reduce channel slope and velocity changes that can lead to aquatic habitat degradation.

There are a number of other approaches for modeling fluvial systems, including statistical and physical models and simpler stream power models.[38] The use of these models in California is described in Stein and Zaleski (2005).[39] Rather than prescribe a specific one-size-fits-all modeling method in this permit, the State Water Board intends to develop a stream power and channel evolution model-based framework to assess channels and develop a hierarchy of suitable analysis methods and management strategies. In time, this framework may become a State Water Board water quality control policy.

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[33] Hammer 1973 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp;
Booth, D.B. 1990. Stream Channel Incision Following Drainage Basin Urbanization. *Water Resour. Bull.* 26:407-417.
[34] Trimble, S.W. 1997. Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed. *Science*: Vol. 278 (21), pp. 1442-1444.
[35] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.
[36] Horner, R.R. 2006. Investigation of the Feasibility and Benefits of Low-Impact Site Design Practices (LID) for the San Diego Region. Available at: http://www.projectcleanwater.org/pdf/permit/case-study_lid.pdf.
[37] Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[38] Finlayson, D.P. and D.R. Montgomery. 2003. Modeling large-scale fluvial erosion in geographic information systems. Geomorphology (53), pp. 147-164).
[39] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

Permit Linkage to Overbank and Extreme Flood Protection
Site design BMPs (e.g. rooftop and impervious disconnection, vegetated swales, setbacks and buffers) filter and settle out pollutants and provide for more infiltration than is possible for traditional centralized structural BMPs placed at the lowest point in a site. They provide source control for runoff and lead to a reduction in pollutant loads. When implemented, they also help reduce the magnitude and volume of larger, less frequent storm events (e.g., 10-yr, 24-hour storm and larger), thereby reducing the need for expensive flood control infrastructure. Nonstructural BMPs can also be a landscape amenity, instead of a large isolated structure requiring substantial area for ancillary access, buffering, screening and maintenance facilities.[25] The multiple benefits of using non-structural benefits will be critically important as the state's population increases and imposes strains upon our existing water resources.

Maintaining predevelopment drainage densities and times of concentration will help reduce post-development peak flows and volumes in areas not covered under a municipal permit. The most effective way to preserve drainage areas and maximize time of concentration is to implement landform grading, incorporate site design BMPs and implement distributed structural BMPs (e.g., bioretention cells, rain gardens, rain cisterns).

M. Storm Water Pollution Prevention Plans

USEPA's Construction General Permit requires that qualified personnel conduct inspections. USEPA defines qualified personnel as "a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity."[40] USEPA also suggests that qualified personnel prepare SWPPPs and points to numerous states that require certified professionals to be on construction sites at all times. States that currently have certification programs are Washington, Georgia, Florida, Delaware, Maryland, and New Jersey. The Permit 99-08-DWQ did not require that qualified personnel prepare SWPPPs or conduct inspections. However, to ensure that water quality is being protected, this General Permit requires that all SWPPPs be written, amended, and certified by a Qualified SWPPP Developer. A Qualified SWPPP Developer must possess one of the eight certifications and or registrations specified in this General Permit and effective two years after the adoption date of this General Permit, must have attended a State Water Board-sponsored or approved Qualified SWPPP Developer training course. Table 9 provides an overview of the criteria used in determining qualified certification titles for a QSD and QSP.

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40 US Environmental Protection Agency. Stormwater Pollution Prevention Plans for Construction Activities. <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm> and <http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf>.

Table 9 - Qualified SWPPP Developer/ Qualified SWPPP Practitioner Certification Criteria

Certification/ Title	Registered By	QSD/QSP	Certification Criteria
Professional Civil Engineer	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Geologist or Engineering Geologist	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Landscape Architect	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Hydrologist	American Institute of Hydrology	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Certified Professional in Erosion and Sediment Control™ (CPESC)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Inspector of Sediment and Erosion Control™ (CISEC)	Certified Inspector of Sediment and Erosion Control, Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Erosion, Sediment and Storm Water Inspector™ (CESSWI)	Enviro Cert International Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Professional in Storm Water Quality™ (CPSWQ)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education

The previous versions of the General Permit required development and implementation of a SWPPP as the primary compliance mechanism. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of storm water discharges; and (2) to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges. The SWPPP must include BMPs that address source control, BMPs that address pollutant control, and BMPs that address treatment control.

This General Permit shifts some of the measures that were covered by this general requirement to specific permit requirements, each individually enforceable as a permit term. This General Permit emphasizes the use of appropriately selected, correctly installed and maintained pollution reduction BMPs. This approach provides the flexibility necessary to establish BMPs that can effectively address source control of pollutants during changing construction activities. These specific requirements also improve both the clarity and the enforceability of the General Permit so that the dischargers understand, and the public can determine whether the discharges are in compliance with, permit requirements.

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the General Permit. For LUPs the discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio or telephone. Once construction activities are complete, until stabilization is achieved, the SWPPP shall be available from the SWPPP contact listed in the PRDs

A SWPPP must be appropriate for the type and complexity of a project and will be developed and implemented to address project specific conditions. Some projects may have similarities or complexities, yet each project is unique in its progressive state that requires specific description and selection of BMPs needed to address all possible generated pollutants

N. Regional Water Board Authorities

Because this General Permit will be issued to thousands of construction sites across the State, the Regional Water Boards retain discretionary authority over certain issues that may arise from the discharges in their respective regions. This General Permit does not grant the Regional Water Boards any authority they do not otherwise have; rather, it merely emphasizes that the Regional Water Boards can take specific actions related to this General Permit. For example, the Regional Water Boards will be enforcing this General Permit and may need to adjust some requirements for a discharger based on the discharger’s compliance history.

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

Arnold Schwarzenegger
Governor

Division of Water Quality
1001 I Street • Sacramento, California 95814 • (916) 341-5455
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100
Fax (916) 341-5463 • http://www.waterboards.ca.gov

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

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STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002

WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.

2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.

5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.

6. Pursuant to 40 C.F.R. § 131.12 and State Water Board Resolution No. 68-16,[1] which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.

7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.

8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.

9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

[1] Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.

11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.

12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.

13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.

14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.

15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.

16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.

17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.

21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[2]

23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

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[2] Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.

28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

29. Construction activity covered by an individual NPDES Permit for storm water discharges.

30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 (“R” in the Revised Universal Soil Loss Equation).

31. Landfill construction activity that is subject to the Industrial General Permit.

32. Construction activity that discharges to Combined Sewer Systems.

33. Conveyances that discharge storm water runoff combined with municipal sewage.

34. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.

37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and No. 2003-0007-DWQ. For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)[3]. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.

42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

43. This General Permit prohibits the discharge of any debris[4] from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.

45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

[3] BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

[4] Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.

47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.

48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.

49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.

50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS[5]) can prevent or reduce the release of fine particles from construction sites.

[5] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, “The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities,” dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel’s suggestions into this General Permit, which includes both numeric action levels (NALs) and NELs for pH and turbidity, and special numeric limits for ATS discharges.

Numeric Effluent Limitations

53. Discharges of storm water from construction activities may become contaminated from alkaline construction materials resulting in high pH (greater than pH 7). Alkaline construction materials include, but are not limited to, hydrated lime, concrete, mortar, cement kiln dust (CKD), Portland cement treated base (CTB), fly ash, recycled concrete, and masonry work. This General Permit includes an NEL for pH (6.0-9.0) that applies only at sites that exhibit a "high risk of high pH discharge." A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.

54. For Risk Level 3 discharges, this General Permit establishes technology-based, numeric effluent limitations (NELs) for turbidity of 500 NTU. Exceedances of the turbidity NEL constitutes a violation of this General Permit.

55. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based NELs for Risk Level 3 dischargers.

Determining Compliance with Numeric Limitations

56. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. The NALs in this General Permit for pH and turbidity are not directly enforceable and do not constitute NELs.

57. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is required to provide an NAL Exceedance Report when requested by a Regional Water Board.

58. If run-on is caused by a forest fire or any other natural disaster, then NELs do not apply.

59. Exceedances of the NELs are a violation of this Permit. This General Permit requires dischargers with NEL exceedances to implement additional monitoring, BMPs, and revise their SWPPPs accordingly. Dischargers are required to notify the State and Regional Water Boards of the violation through the State Water Boards SMARTs system, and provide an NEL Violation Report sharing additional information concerning the NEL exceedance.

I. Receiving Water Limitations

60. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

61. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

62. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

63. For all Risk Level 3 and Risk Level 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

64. Risk Level 3 sites in violation of the Numeric Effluent Limitations contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring.

65. For Risk Level 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

66. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.

67. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.

68. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.

69. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

70. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially

cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

71. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.

72. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.

73. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

74. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

75. This General Permit includes performance standards for post-construction that are consistent with State Water Board Resolution No. 2005-0006, "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and 2008-0030, "Requiring Sustainable Water Resources Management." The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This "runoff reduction" approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

76. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

77. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.

78. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

79. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)[6]:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.

3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

B. Obtaining Permit Coverage Traditional Construction Sites

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[6] These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.

2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

3. PRDs shall consist of:

    a. Notice of Intent (NOI)
    b. Risk Assessment (Section VIII)
    c. Site Map
    d. Storm Water Pollution Prevention Plan (Section XIV)
    e. Annual Fee
    f. Signed Certification Statement

    Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

    Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.

    a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.

    b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated. Existing dischargers shall electronically file their PRDs no later than

July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.

6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.

7. Small Construction Rainfall Erosivity Waiver

   EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

   Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

   If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.

2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:

   a. A revised NOI indicating the new project size;

   b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.

   c. SWPPP revisions, as appropriate; and

   d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.

   e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved “Final Stabilization” as defined in Section II.D.

4. When an LRP owns property with active General Permit coverage, and the LRP sells the property, or a parcel thereof, to another person, that person shall become an LRP with respect to whatever parcel was sold. The existing LRP shall inform the new LRP of the General Permit’s requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP’s approved signatory, must submit PRDs in accordance with this General Permit’s requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

   a. For purposes of “final stabilization,” the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;

   b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;

   c. Final stabilization has been reached;

   d. Construction materials and wastes have been disposed of properly;

   e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;

   f. Post-construction storm water management measures have been installed and a long-term maintenance plan[7] has been established; and

[7] For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.

3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:

   a. "70% final cover method," no computational proof required

      OR:

   b. "RUSLE or RUSLE2 method," computational proof required

      OR:

   c. "Custom method", the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the "final stabilization" requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.

C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;

2. The discharge does not violate any other provision of this General Permit;

3. The discharge is not prohibited by the applicable Basin Plan;

4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.

5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs and NELs; and

7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

D. Debris resulting from construction activities are prohibited from being discharged from construction sites.

E. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

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

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.

2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notice of Terminations (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS.

   a. The LRP's Approved Signatory must be one of the following:

      i. For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

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

      iii. For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA);

      iv. For the military: Any military officer who has been designated.

      v. For a public university: An authorized university official

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

2. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

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

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass[8] is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;[9]

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[8] The intentional diversion of waste streams from any portion of a treatment facility

[9] Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;

3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or

4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset[10] in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

    a. An upset occurred and that the discharger can identify the cause(s) of the upset

    b. The treatment facility was being properly operated by the time of the upset

    c. The discharger submitted notice of the upset as required; and

    d. The discharger complied with any remedial measures required

2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.

3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

[10] An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

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

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[11] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

[11] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

V. EFFLUENT STANDARDS

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

B. Numeric Effluent Limitations (NELs)

Table 1- Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU	N/A
		Risk Level 3			250 NTU	500 NTU

1. Numeric Effluent Limitations (NELs):

   a. **Storm Event, Daily Average pH Limits –** For Risk Level 3 dischargers, the pH of storm water and non-storm water discharges shall be within the ranges specified in Table 1 during any site phase where there is a "high risk of pH discharge."[12]

b. **Storm Event Daily Average Turbidity Limit –** For Risk Level 3 dischargers, the turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

2. If daily average sampling results are outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file monitoring results in violation within 5 business days of obtaining the results.

3. **Compliance Storm Event**:

   Discharges of storm water from Risk Level 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for Risk Level 3 discharges is the 5 year, 24 hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

C. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

[12] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.

3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

    a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

    AND/OR:

    b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

VI. RECEIVING WATER LIMITATIONS

A. The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

B. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

C. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

D. Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

    a. A California registered professional civil engineer;

    b. A California registered professional geologist or engineering geologist;

    c. A California registered landscape architect;

    d. A professional hydrologist registered through the American Institute of Hydrology;

    e. A Certified Professional in Erosion and Sediment Control (CPESC) ™ registered through Enviro Cert International, Inc.;

    f. A Certified Professional in Storm Water Quality (CPSWQ) ™ registered through Enviro Cert International, Inc.; or

    g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or

   b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.

5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,[13] the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

[13] Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres http://cain.ice.ucdavis.edu/calwater/calwfaq.html, http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175 .

XIII. POST-CONSTRUCTION STANDARDS

A. All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.

1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.

2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.

3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.

4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream[14] or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

[14] A first order stream is defined as a stream with no tributaries.

B. All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

A. The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;

2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;

3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;

4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and

5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.

B. To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

C. The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

A. In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.

B. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

C. Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

D. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

E. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

A. All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.

B. The discharger shall certify each Annual Report in accordance with the Special Provisions.

C. The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.

D. The discharger shall include storm water monitoring information in the Annual Report consisting of:

1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;

2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

3. a summary of all corrective actions taken during the compliance year;

4. identification of any compliance activities or corrective actions that were not implemented;

5. a summary of all violations of the General Permit;

6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;

7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and

8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.

E. The discharger shall provide training information in the Annual Report consisting of:

1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and

3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

ATTACHMENT A
Linear Underground/ Overhead Requirements

All Linear Underground/Overhead project dischargers who submit permit registration documents (PRDs) indicating their intention to be regulated under the provisions of this General Permit shall comply with the following:

A. DEFINITION OF LINEAR UNDERGROUND/OVERHEAD PROJECTS

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquiescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. LUP evaluation shall consist of two tasks:

a. Confirm that the project or project section(s) qualifies as an LUP. The State Water Board website contains a project determination guidance flowchart. http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

b. Identify which Type(s) (1, 2 or 3 described in Section I below) are applicable to the project or project sections based on project sediment and receiving water risk. (See Attachment A.1)

3. A Legally Responsible Person (LRP) for a Linear Underground/Overhead project is required to obtain CGP coverage under one or more permit registration document (PRD) electronic submittals to the State Water Board's Storm Water Multi-Application and Report Tracking (SMARTs) system. Attachment A.1 contains a flow chart to be used when determining if a linear project qualifies for coverage and to determine LUP Types. Since a LUP may be constructed within both developed and undeveloped locations and portions of LUPs may be constructed by different contractors, LUPs may be broken into logical permit sections. Sections may be determined based on portions of a project conducted by one contractor. Other situations may also occur, such as the time period in which the sections of a project will be constructed (e.g. project phases), for which separate permit coverage is possible. For projects that are broken into separate sections, a description of how each section relates to the overall project and the definition of the boundaries between sections shall be clearly stated.

4. Where construction activities transverse or enter into different Regional Water Board jurisdictions, LRPs shall obtain permit coverage for each Regional Water Board area involved prior to the commencement of construction activities.

5. Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small linear construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

B. LINEAR PROJECT PERMIT REGISTRATION DOCUMENTS (PRDs)

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted. PRDs shall consist of the following:

1. Notice of Intent (NOI)

Prior to construction activities, the LRP of a proposed linear underground/overhead project shall utilize the processes and methods provided in Attachment A.2, Permit Registration Documents (PRDs) – General Instructions for Linear Underground/Overhead Projects to comply with the Construction General Permit.

2. Site Maps

LRPs submitting PRDs shall include at least 3 maps. The first map will be a zoomed[1] 1000-1500 ft vicinity map that shows the starting point of the project. The second will be a zoomed map of 1000-1500 ft showing the ending location of the project. The third will be a larger view vicinity map, 1000 ft to 2000 ft, displaying the entire project location depending on the project size, and indicating the LUP type (1, 2 or 3) areas within the total project footprint.

3. Drawings

LRPs submitting PRDs shall include a construction drawing(s) or other appropriate drawing(s) or map(s) that shows the locations of storm drain

[1] An image with a close-up/enhanced detailed view of site features that show minute details such as streets and neighboring structures.
Or: An image with a close-up/enhanced detailed view of the site's surrounding infrastructure.
Or: An image with a close up detailed view of the project and its surroundings.

inlets and waterbodies[2] that may receive discharges from the construction activities and that shows the locations of BMPs to be installed for all those BMPs that can be illustrated on the revisable drawing(s) or map(s). If storm drain inlets, waterbodies, and/or BMPs cannot be adequately shown on the drawing(s) or map(s) they should be described in detail within the SWPPP.

4. Storm Water Pollution Prevention Plan (SWPPP)

LUP dischargers shall comply with the SWPPP Preparation, Implementation, and Oversight requirements in Section K of this Attachment.

5. Contact information

LUP dischargers shall include contact information for all contractors (or subcontractors) responsible for each area of an LUP project. This should include the names, telephone numbers, and addresses of contact personnel. Specific areas of responsibility of each contact, and emergency contact numbers should also be included.

6. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. LINEAR PROJECT TERMINATION OF COVERAGE REQUIREMENTS

The LRP may terminate coverage of an LUP when construction activities are completed by submitting an electronic notice of termination (NOT) through the State Water Board's SMARTS system. Termination requirements are different depending on the complexity of the LUP. An LUP is considered complete when: (a) there is no potential for construction-related storm water pollution; (b) all elements of the SWPPP have been completed; (c) construction materials and waste have been disposed of properly; (d) the site is in compliance with all local storm water management requirements; and (e) the LRP submits a notice of termination (NOT) and has received approval for termination from the appropriate Regional Water Board office.

1. LUP Stabilization Requirements

The LUP discharger shall ensure that all disturbed areas of the construction site are stabilized prior to termination of coverage under this General Permit. Final stabilization for the purposes of submitting an NOT

[2] Includes basin(s) that the MS4 storm sewer systems may drain to for Hydromodification or Hydrological Conditional of Concerns under the MS4 permits.

is satisfied when all soil disturbing activities are completed and one of the following criteria is met:

a. In disturbed areas that were vegetated prior to construction activities of the LUP, the area disturbed must be re-established to a uniform vegetative cover equivalent to 70 percent coverage of the preconstruction vegetative conditions. Where preconstruction vegetation covers less than 100 percent of the surface, such as in arid areas, the 70 percent coverage criteria is adjusted as follows: if the preconstruction vegetation covers 50 percent of the ground surface, 70 percent of 50 percent (.70 X .50=.35) would require 35 percent total uniform surface coverage; or

b. Where no vegetation is present prior to construction, the site is returned to its original line and grade and/or compacted to achieve stabilization; or

c. Equiva lent stabilization measures have been employed. These measures include, but are not limited to, the use of such BMPs as blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, or other erosion resistant soil coverings or treatments.

2. LUP Termination of Coverage Requirements

The LRP shall file an NOT through the State Water Board's SMARTS system. By submitting an NOT, the LRP is certifying that construction activities for an LUP are complete and that the project is in full compliance with requirements of this General Permit and that it is now compliant with soil stabilization requirements where appropriate. Upon approval by the appropriate Regional Water Board office, permit coverage will be terminated.

3. Revising Coverage for Change of Acreage

When the LRP of a portion of an LUP construction project changes, or when a phase within a multi-phase project is completed, the LRP may reduce the total acreage covered by this General Permit. In reducing the acreage covered by this General Permit, the LRP shall electronically file revisions to the PRDs that include:

a. a revised NOI indicating the new project size;

b. a revised site map showing the acreage of the project completed, acreage currently under construction, acreage sold, transferred or added, and acreage currently stabilized.

c. SWPPP revisions, as appropriate; and

d. certification that any new LRPs have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address (if known) of the new LRP.

If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

D. DISCHARGE PROHIBITIONS

1. LUP dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

2. LUP dischargers are prohibited from discharging non-storm water that is not otherwise authorized by this General Permit. Non-storm water discharges authorized by this General Permit[3] may include, fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, street cleaning, dewatering,[4] uncontaminated groundwater from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. Such discharges are allowed by this General Permit provided they are not relied upon to clean up failed or inadequate construction or post-construction BMPs designed to keep materials on site. These authorized non-storm water discharges:

[3] Dischargers must identify all authorized non-storm water discharges in the LUP's SWPPP and identify BMPs that will be implemented to either eliminate or reduce pollutants in non-storm water discharges. Regional Water Boards may direct the discharger to discontinue discharging such non-storm water discharges if determined that such discharges discharge significant pollutants or threaten water quality.
[4]Dewatering activities may be prohibited or need coverage under a separate permit issued by the Regional Water Boards. Dischargers shall check with the appropriate Regional Water Boards for any required permit or basin plan conditions prior to initial dewatering activities to land, storm drains, or waterbodies.

a. Shall not cause or contribute to a violation of any water quality standard;

b. Shall not violate any other provision of this General Permit;

c. Shall not violate any applicable Basin Plan;

d. Shall comply with BMPs as described in the SWPPP;

e. Shall not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

f. Shall be monitored and meets the applicable NALs and NELs; and

g. Shall be reported by the discharger in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not authorized by this General Permit to determine the need for a separate NPDES permit.

Additionally, some LUP dischargers may be required to obtain a separate permit if the applicable Regional Water Board has adopted a General Permit for dewatering discharges. Wherever feasible, alternatives, that do not result in the discharge of non-storm water, shall be implemented in accordance with this Attachment's Section K.2 - SWPPP Implementation Schedule.

3. LUP dischargers shall ensure that trench spoils or any other soils disturbed during construction activities that are contaminated[5] are not discharged with storm water or non-storm water discharges into any storm drain or water body except pursuant to an NPDES permit.

When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the LUP discharger shall have those soils sampled and tested to ensure that proper handling and public safety measures are

[5] Contaminated soil contains pollutants in concentrations that exceed the appropriate thresholds that various regulatory agencies set for those substances. Preliminary testing of potentially contaminated soils will be based on odor, soil discoloration, or prior history of the site's chemical use and storage and other similar factors. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The legally responsible person will notify the appropriate local, State, or federal agency(ies) when contaminated soil is found at a construction site, and will notify the Regional Water Board by submitting an NOT at the completion of the project.

implemented. The LUP discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

4. Discharging any pollutant-laden water that will cause or contribute to an exceedance of the applicable Regional Water Board's Basin Plan from a dewatering site or sediment basin into any receiving water or storm drain is prohibited.

5. Debris[6] resulting from construction activities are prohibited from being discharged from construction project sites.

E. SPECIAL PROVISIONS

1. Duty to Comply

a. The LUP discharger must comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

b. The LUP discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

2. General Permit Actions

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

[6] Litter, rubble, discarded refuse, and remains of something destroyed.

b. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

3. Need to Halt or Reduce Activity Not a Defense

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

4. Duty to Mitigate

The LUP discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

5. Proper Operation and Maintenance

The LUP discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit and with the requirements of the Storm Water Pollution Prevention Plan (SWPPP). Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

6. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

7. Duty to Maintain Records and Provide Information

a. The LUP discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be kept at the construction site or in a crew member's vehicle until construction is completed, and shall be made available upon request.

b. The LUP discharger shall furnish the Regional Water Board, State Water Board, or USEPA, within a reasonable time, any requested information to determine compliance with this General Permit. The LUP discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

8. Inspection and Entry

The LUP discharger shall allow the Regional Water Board, State Water Board, USEPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

b. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

c. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

d. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

9. Electronic Signature and Certification Requirements

a. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS. For Linear Underground/Overhead projects, the Legally Responsible Person is the person in charge of the utility company, municipality, or other public or private company or agency that owns or operates the LUP. The LRP's Approved Signatory must be one of the following:

i For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(1) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(2) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

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

iii For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

c. All SWPPP revisions, annual reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, USEPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

10. Certification

Any person signing documents under Section E.9 above, shall make the following certification:

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

11. Anticipated Noncompliance

The LUP discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

12. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

13. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the LUP discharger is or may be subject to under Section 311 of the CWA.

14. Severability

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

15. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of USEPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

16. Penalties for Violations of Permit Conditions

a. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[7] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

b. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

17. Transfers

This General Permit is not transferable. A new LRP of an ongoing construction activity must submit PRDs in accordance with the requirements of this General Permit to be authorized to discharge under this General Permit. An LRP who is a property owner with active General Permit coverage who sells a fraction or all the land shall inform the new property owner(s) of the requirements of this General Permit.

18. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

F. EFFLUENT STANDARDS

1. Narrative Effluent Limitations

a. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges regulated by this General Permit do not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

b. LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of structural or non-structural controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

[7] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act

2. Numeric Effluent Limitations (NELs)

Table 1. Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	LUP Type 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		LUP Type 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	LUP Type 2	1 NTU		250 NTU	N/A
		LUP Type 3			250 NTU	500 NTU

a. Numeric Effluent Limitations (NELs):

i **Storm Event, Daily Average pH Limits –** For LUP Type 3 dischargers, the daily average pH of storm water and non-storm water discharges shall be within the ranges specified in Table 1 during any project phase where there is a "high risk of pH discharge."[8]

ii **Storm Event Daily Average Turbidity Limit –** For LUP Type 3 dischargers, the daily average turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

[8] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

b. If a daily average sample result is outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file the results in violation within 5 business days of obtaining the results.

c. Compliance Storm Event:

Discharges of storm water from LUP Type 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for LUP Type 3 discharges is the 5-year, 24-hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

d. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

3. Numeric Action Levels (NALs)

a. For LUP Type 2 and 3 dischargers, the lower storm event daily average NAL for pH is 6.5 pH units and the upper storm event daily average NAL for pH is 8.5 pH units. The LUP discharger shall take actions as described below if the storm event daily average discharge is outside of this range of pH values.

b. For LUP Type 2 and 3 dischargers, the storm event daily average NAL for turbidity is 250 NTU. The discharger shall take actions as described below if the storm event daily average discharge is outside of this range of turbidity values.

c. Whenever daily average analytical effluent monitoring results indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the LUP discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

d. The site evaluation will be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

i Are related to the construction activities and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

AND/OR:

ii Are related to the run-on associated with the construction site location and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) decide what corrective action(s) were taken or will be taken, including a description of the schedule for completion.

G. RECEIVING WATER LIMITATIONS

1. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

2. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

3. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board’s Water Quality Control Plan (Basin Plan).

H. TRAINING QUALIFICATIONS

1. General

All persons responsible for implementing requirements of this General Permit shall be appropriately trained. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Persons responsible for preparing, amending and certifying SWPPPs shall comply with the requirements in this Section H.

2. SWPPP Certification Requirements

a. **Qualified SWPPP Developer:** The LUP discharger shall ensure that all SWPPPs be written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

i A California registered professional civil engineer;

ii A California registered professional geologist or engineering geologist;

iii A California registered landscape architect;

iv A professional hydrologist registered through the American Institute of Hydrology;

v A certified professional in erosion and sediment control (CPESC) ™ registered through Enviro Cert International, Inc;

vi A certified professional in storm water quality (CPSWQ)™ registered through Enviro Cert International, Inc.; or

vii A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

b. The LUP discharger shall ensure that the SWPPP is written and amended, as needed, to address the specific circumstances for each construction site covered by this General Permit prior to commencement of construction activity for any stage.

c. The LUP discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

d. **Qualified SWPPP Practitioner:** The LUP discharger shall ensure that all elements of any SWPPP for each project will be implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis, and for ensuring full compliance with the permit and implementation of all elements of the SWPPP. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   i A certified erosion, sediment and storm water inspector registered through Certified Professional in Erosion and Sediment Control, Inc.; or

   ii A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

e. The LUP discharger shall ensure that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner, and who is ultimately responsible for implementation of the SWPPP. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

f. The LUP discharger shall ensure that the SWPPP and each amendment be signed by the Qualified SWPPP Developer. The LUP discharger shall include a listing of the date of initial preparation and the dates of each amendment in the SWPPP.

I. TYPES OF LINEAR PROJECTS

This attachment establishes three types (Type 1, 2 & 3) of complexity for areas within an LUP or project section based on threat to water quality. Project area Types are determined through Attachment A.1.

The Type 1 requirements below establish the baseline requirements for all LUPs subject to this General Permit. Additional requirements for Type 2 and Type 3 LUPs are labeled.

1. Type 1 LUPs:

LUP dischargers with areas of a LUP designated as Type 1 shall comply with the requirements in this Attachment. Type 1 LUPs are:

a. Those construction areas where 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day; or

b. Where greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

   i Areas disturbed during construction will be returned to preconstruction conditions or equivalent protection is established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

   ii Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization BMPs will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

c. Where the risk determination is as follows:

   i Low sediment risk, low receiving water risk, or

   ii Low sediment risk, medium receiving water risk, or

   iii Medium sediment risk, low receiving water risk

2. **Type 2 LUPs**:

   Type 2 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 2 LUPs have the specified combination of risk:

   d. High sediment risk, low receiving water risk, or

   e. Medium sediment risk, medium receiving water risk, or

   f. Low sediment risk, high receiving water risk

   Receiving water risk is either considered “Low” for those areas of the project that are not in close proximity to a sensitive receiving watershed, “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, and “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C of this General Permit.

3. **Type 3 LUPs:**

   Type 3 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 3 LUPs have the specified combination of risk:

   a. High sediment risk, high receiving water risk, or

   b. High sediment risk, medium receiving water risk, or

   c. Medium sediment risk, high receiving water risk

   Receiving water risk is either considered “Medium” for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, or “High” where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C.

J. LUP TYPE-SPECIFIC REQUIREMENTS

1. Effluent Standards

   a. Narrative – LUP dischargers shall comply with the narrative effluent standards below.

i Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

ii LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

b. Numeric – LUP Type 1 dischargers are not subject to a numeric effluent standard

c. Numeric –LUP Type 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

d. Numeric – LUP Type 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU. In addition, LUP Type 3 dischargers are subject to a pH NEL of 6.0-9.0 and a turbidity NEL of 500 NTU.

2. Good Site Management "Housekeeping"

a. LUP dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, the good housekeeping measures shall consist of the following:

i Identify the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

ii Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

iii Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

iv Minimize exposure of construction materials to precipitation (not applicable to materials designed to be outdoors and exposed to the environment).

v Implement BMPs to control the off-site tracking of loose construction and landscape materials.

b. LUP dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

i Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

ii Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

iii Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

iv Cover waste disposal containers at the end of every business day and during a rain event.

v Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

vi Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

vii Implement procedures that effectively address hazardous and non-hazardous spills.

viii Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

(1) Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

(2) Appropriate spill response personnel are assigned and trained.

ix Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

c. LUP dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   i Prevent oil, grease, or fuel from leaking into the ground, storm drains or surface waters.

   ii Implement appropriate BMPs whenever equipment or vehicles are fueled, maintained or stored.

   iii Clean leaks immediately and disposing of leaked materials properly.

d. LUP dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   i Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   ii Contain fertilizers and other landscape materials when they are not actively being used.

   iii Discontinue the application of any erodible landscape material at least 2 days before a forecasted rain event[9] or during periods of precipitation.

   iv Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   v Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

e. LUP dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, LUP dischargers shall do the following:

[9] 50% or greater chance of producing precipitation.

i Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

ii Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

iii Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

iv Ensure retention of sampling, visual observation, and inspection records.

v Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

f. LUP dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations.

3. Non-Storm Water Management

a. LUP dischargers shall implement measures to control all non-storm water discharges during construction.

b. LUP dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

c. LUP dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

4. Erosion Control

a. LUP dischargers shall implement effective wind erosion control.

b. LUP dischargers shall provide effective soil cover for inactive[10] areas and all finished slopes, and utility backfill.

[10] Areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days

c. LUP dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

5. Sediment Controls

a. LUP dischargers shall establish and maintain effective perimeter controls as needed, and implement effective BMPs for all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

b. On sites where sediment basins are to be used, LUP dischargers shall, at minimum, design sediment basins according to the guidance provided in CASQA's Construction BMP Handbook.

c. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[11] in accordance with Table 2 below.

Table 2 – Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

d. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent off-site tracking of sediment.

e. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

f. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall inspect all immediate access roads. At a minimum daily and prior to any rain event, the discharger shall remove any

[11] Sheet flow length is the length that shallow, low velocity flow travels across a site.

sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

g. **Additional LUP Type 3 Requirement:** The Regional Water Board may require LUP Type 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

6. Run-on and Run-off Controls

a. LUP dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site-shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this Attachment.

b. Run-on and runoff controls are not required for Type 1 LUPs unless the evaluation of quantity and quality of run-on and runoff deems them necessary or visual inspections show that the site requires such controls.

7. Inspection, Maintenance and Repair

a. All inspection, maintenance repair and sampling activities at the discharger's LUP location shall be performed or supervised by a QSP representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

b. LUP dischargers shall conduct visual inspections and observations daily during working hours (not recorded). At least once each 24-hour period during extended storm events, **LUP Type 2 & 3 dischargers** shall conduct visual inspections to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

c. Upon identifying failures or other shortcomings, as directed by the QSP, LUP dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

d. For each pre- and post-rain event inspection required, LUP dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format that includes the information described below.

e. The LUP discharger shall ensure that the checklist remains on-site or with the SWPPP. At a minimum, an inspection checklist should include:

i Inspection date and date the inspection report was written.

ii Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

iii Site information, including stage of construction, activities completed, and approximate area of the site exposed.

iv A description of any BMPs evaluated and any deficiencies noted.

v If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

vi Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

vii Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

viii Photographs taken during the inspection, if any.

ix Inspector’s name, title, and signature.

K. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

1. Objectives

SWPPPs for all LUPs shall be developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

a. All pollutants and their sources, including sources of sediment, associated with construction activities associated with LUP activity are controlled;

b. All non-storm water discharges are identified and either eliminated, controlled, or treated;

c. BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from LUPs during construction; and

d. Stabilization BMPs installed to reduce or eliminate pollutants after construction is completed are effective and maintained.

2. SWPPP Implementation Schedule

a. LUPs for which PRDs have been submitted to the State Water Board shall develop a site/project location SWPPP prior to the start of land-disturbing activity in accordance with this Section and shall implement the SWPPP concurrently with commencement of soil-disturbing activities.

b. For an ongoing LUP involving a change in the LRP, the new LRP shall review the existing SWPPP and amend it, if necessary, or develop a new SWPPP within 15 calendar days to conform to the requirements set forth in this General Permit.

3. Availability

The SWPPP shall be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

L. REGIONAL WATER BOARD AUTHORITIES

1. Regional Water Boards shall administer the provisions of this General Permit. Administration of this General Permit may include, but is not limited to, requesting the submittal of SWPPPs, reviewing SWPPPs, reviewing monitoring and sampling and analysis reports, conducting compliance inspections, gathering site information by any medium including sampling, photo and video documentation, and taking enforcement actions.

2. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

3. Regional Water Boards may issue separate permits for discharges of storm water associated with construction activity to individual dischargers, categories of dischargers, or dischargers in a geographic area. Upon issuance of such permits by a Regional Water Board, dischargers subject to those permits shall no longer be regulated by this General Permit.

4. Regional Water Boards may direct the discharger to reevaluate the LUP Type(s) for the project (or elements/areas of the project) and impose the appropriate level of requirements.

5. Regional Water Boards may terminate coverage under this General Permit for dischargers who negligently or with willful intent incorrectly determine or report their LUP Type (e.g., they determine themselves to be a LUP Type 1 when they are actually a Type 2).

6. Regional Water Boards may review PRDs and reject or accept applications for permit coverage or may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

7. Regional Water Boards may impose additional requirements on dischargers to satisfy TMDL implementation requirements or to satisfy provisions in their Basin Plans.

8. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

9. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

10. Based on an LUP's threat to water quality and complexity, the Regional Water Board may determine on a case-by-case basis that an LUP, or a portion of an LUP, is not eligible for the linear project requirements contained in this Attachment, and require that the discharger comply with all standard requirements in this General Permit.

11. The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

M. MONITORING AND REPORTING REQUIREMENTS

Table 3. LUP Summary of Monitoring Requirements

LUP Type	Visual Inspections				Sample Collection		
	Daily Site BMP	Pre-storm Event Baseline	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water	Non-Visible (when applicable)
1	X						x
2	X	X	X	X	X		x
3	X	X	X	X	X	X	x

1. Objectives

LUP dischargers shall prepare a monitoring and reporting program (M&RP) prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The M&RP must be a part of the SWPPP, included as an appendix or separate SWPPP chapter.

2. M&RP Implementation Schedule

a. LUP dischargers shall implement the requirements of this Section at the time of commencement of construction activity. LUP dischargers are responsible for implementing these requirements until construction activity is complete and the site is stabilized.

b. LUP dischargers shall revise the M&RP when:

i Site conditions or construction activities change such that a change in monitoring is required to comply with the requirements and intent of this General Permit.

ii The Regional Water Board requires the discharger to revise its M&RP based on its review of the document. Revisions may include, but not be limited to, conducting additional site inspections, submitting reports, and certifications. Revisions shall be submitted via postal mail or electronic e-mail.

iii The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

3. LUP Type 1 Monitoring and Reporting Requirements

a. LUP Type 1 Inspection Requirements

i LUP Type 1 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 1 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 1 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 1 dischargers shall conduct daily visual inspections to verify that:

(1) Appropriate BMPs for storm water and non-storm water are being implemented in areas where active construction is occurring (including staging areas);

(2) Project excavations are closed, with properly protected spoils, and that road surfaces are cleaned of excavated material and construction materials such as chemicals by either removing or storing the material in protective storage containers at the end of every construction day;

(3) Land areas disturbed during construction are returned to pre-construction conditions or an equivalent protection is used at the end of each workday to eliminate or minimize erosion and the possible discharge of sediment or other pollutants during a rain event.

v Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vi Inspection programs are required for LUP Type 1 projects where temporary and permanent stabilization BMPs are installed and are to be monitored after active construction is completed. Inspection activities shall continue until adequate permanent stabilization is established and, in areas where re-vegetation is chosen, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

b. <u>LUP Type 1 Monitoring Requirements for Non-Visible Pollutants</u>

LUP Type 1 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where the LUP Type 1 discharger believes pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help the LUP Type 1 discharger determine when to collect samples.

(2) The LUP Type 1 discharger is not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 1 dischargers shall collect samples down-gradient from all discharge locations where the visual observations were made triggering the monitoring, and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 1 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 1 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[12]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 1 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 1 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

c. LUP Type 1 Visual Observation Exceptions

i LUP Type 1 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. The Type 1 LUP discharger is not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

[12] Sample collected at a location unaffected by contruction activities.

ii If the LUP Type 1 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

d. Particle Size Analysis for Risk Justification

LUP Type 1 dischargers utilizing justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

4. LUP Type 2 & 3 Monitoring and Reporting Requirements

a. LUP Type 2 & 3 Inspection Requirements

i LUP Type 2 & 3 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 2 & 3 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 2 & 3 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 2 & 3 dischargers shall conduct daily visual inspections to verify that appropriate BMPs for storm water and non-storm water are being implemented and in place in areas where active construction is occurring (including staging areas).

v LUP Type 2 & 3 dischargers shall conduct inspections of the construction site prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. Pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that BMPs have functioned adequately. During extended storm events, inspections shall be required during normal working hours for each 24-hour period.

vi Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vii LUP Type 2 & 3 dischargers shall implement a monitoring program for inspecting projects that require temporary and permanent stabilization BMPs after active construction is complete. Inspections shall ensure that the BMPs are adequate and maintained. Inspection activities shall continue until adequate permanent stabilization is established and, in vegetated areas, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

viii If possible, LUP Type 2 & 3 dischargers shall install a rain gauge on-site at an accessible and secure location with readings made during all storm event inspections. When readings are unavailable, data from the closest rain gauge with publically available data may be used.

ix LUP Type 2 & 3 dischargers shall Include and maintain a log of the inspections conducted in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection.

b. LUP Type 2 & 3 Storm Water Effluent Monitoring Requirements

Table 4. LUP Type 2 & 3 Effluent Monitoring Requirements

LUP Type	Frequency	Effluent Monitoring
2	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	Turbidity, pH, and non-visible pollutant parameters (if applicable)
3	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	turbidity, pH, suspended sediment concentrations (SSC)[13] (only if turbidity NEL exceeded), plus non-visible pollutant parameters (if applicable)

i LUP Type 2 & 3 dischargers shall collect storm water grab samples from sampling locations characterizing discharges associated with

[13] Suspended Sediment Concentration monitoring is required for any Type 3 area that exceeds its turbidity NEL.

activity from the LUP active areas of construction. At a minimum, 3 samples shall be collected per day of discharge.

ii LUP Type 2 & 3 dischargers shall collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

iii LUP Type 2 & 3 dischargers shall ensure that storm water grab sample(s) obtained be representative of the flow and characteristics of the discharge.

iv LUP Type 2 & 3 dischargers shall analyze their effluent samples for:

(1) pH and turbidity
(2) Any additional parameter for which monitoring is required by the Regional Water Board.

v LUP Type 3 dischargers that have violated the turbidity daily average NEL shall analyze subsequent effluent samples for turbidity and SSC.

c. <u>LUP Type 2 & 3 Storm Water Effluent Sampling Locations</u>

i LUP Type 2 & 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire disturbed project or area.

ii LUP Type 2 & 3 dischargers may monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to exceedance of NALs or NELs (applicable to Type 3).

iii LUP Type 2 & 3 dischargers shall select analytical test methods from the list provided in Table 5 below.

iv LUP Type 2 & 3 dischargers shall ensure that all storm water sample collection preservation and handling shall be conducted in accordance with the “Storm Water Sample Collection and Handling Instructions” below.

d. <u>LUP Type 3 Receiving Water Monitoring Requirements</u>

i In the event that an LUP Type 3 discharger violates an applicable NEL contained in this General Permit and has a direct discharge to receiving waters, the LUP discharger shall subsequently sample Receiving Waters (RWs) for turbidity, pH (if applicable) and SSC.

ii LUP Type 3 dischargers that meet the project criteria in Appendix 3 of this General Permit and have more than 30 acres of soil disturbance in the project area or project section area designated as Type 3, shall comply with the Bioassessment requirements prior to commencement of construction activity.

iii LUP Type 3 dischargers shall obtain RW samples in accordance with the requirements of the Receiving Water Sampling Locations section (Section M.4.d of this Attachment).

e. <u>LUP Type 3 Receiving Water Sampling Locations</u>

i **Upstream/up-gradient RW samples**: LUP Type 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible to and upstream from the effluent discharge point.

ii **Downstream/down-gradient RW samples**: LUP Type 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible to and downstream from the effluent discharge point.

iii If two or more discharge locations discharge to the same receiving water, LUP Type 3 dischargers may sample the receiving water at a single upstream and downstream location.

f. <u>LUP Type 2 & 3 Monitoring Requirements for Non-Visible Pollutants</u>

LUP Type 2 & 3 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where LUP Type 2 & 3 dischargers believe pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help LUP Type 2 & 3 dischargers determine when to collect samples.

(2) LUP Type 2 & 3 dischargers are not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 2 & 3 dischargers shall collect samples down-gradient from the discharge locations where the visual observations were made triggering the monitoring and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 2 & 3 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 2 & 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 2 & 3 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[14]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 2 & 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 2 & 3 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer’s specification.

viii LUP Type 2 & 3 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

[14] Sample collected at a location unaffected by construction activities

g. <u>LUP Type 2 & 3 Visual Observation and Sample Collection Exceptions</u>

i LUP Type 2 & 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. Type 2 & 3 LUP dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

ii If the LUP Type 2 or 3 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

h. <u>LUP Type 2 & 3 Storm Water Sample Collection and Handling Instructions</u>

LUP Type 2 & 3 dischargers shall refer to Table 5 below for test Methods, detection Limits, and reporting Units. During storm water sample collection and handling, the LUP Type 2 & 3 discharger shall:

i Identify the parameters required for testing and the number of storm water discharge points that will be sampled. Request the laboratory to provide the appropriate number of sample containers, types of containers, sample container labels, blank chain of custody forms, and sample preservation instructions.

ii Determine how to ship the samples to the laboratory. The testing laboratory should receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory). The options are to either deliver the samples to the laboratory, arrange to have the laboratory pick them up, or ship them overnight to the laboratory.

iii Use only the sample containers provided by the laboratory to collect and store samples. Use of any other type of containers could contaminate your samples.

iv Prevent sample contamination, by not touching, or putting anything into the sample containers before collecting storm water samples.

v Not overfilling sample containers. Overfilling can change the analytical results.

vi Tightly screw the cap of each sample container without stripping the threads of the cap.

vii Complete and attach a label to each sample container. The label shall identify the date and time of sample collection, the person taking the sample, and the sample collection location or discharge point. The label should also identify any sample containers that have been preserved.

viii Carefully pack sample containers into an ice chest or refrigerator to prevent breakage and maintain temperature during shipment. Remember to place frozen ice packs into the shipping container. Samples should be kept as close to 4° C (39° F) as possible until arriving at the laboratory. Do not freeze samples.

ix Complete a Chain of Custody form for each set of samples. The Chain of Custody form shall include the discharger's name, address, and phone number, identification of each sample container and sample collection point, person collecting the samples, the date and time each sample container was filled, and the analysis that is required for each sample container.

x Upon shipping/delivering the sample containers, obtain both the signatures of the persons relinquishing and receiving the sample containers.

xi Designate and train personnel to collect, maintain, and ship samples in accordance with the above sample protocols and good laboratory practices.

xii Refer to the Surface Water Ambient Monitoring Program's (SWAMP) Quality Assurance Management Plan (QAMP) for more information on sampling collection and analysis. See http://www.waterboards.ca.gov/water_issues/programs/swamp/[15]
QAMP Link:
http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml

[15] Additional information regarding QAMP can be found at http://mpsl.mlml.calstate.edu/swqacompare.htm.

Table 5. Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Levels	Numeric Effluent Limitation (LUP Type 3)
pH	Field test with calibrated portable instrument	Type 2 & 3	0.2	pH units	Lower = 6.5 upper = 8.5	Lower = 6.0 upper = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Type 2 & 3	1	NTU	250 NTU	500 NTU
SSC	ASTM Method D 3977-97[16]	Type 3 if NEL is exceeded	5 Mg/L		N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[17] fixed-count of 600 org/sample	Type 3 LUPs > 30 acres	N/A N/A		N/A	N/A

i. <u>LUP Type 2 & 3 Monitoring Methods</u>

i The LUP Type 2 or 3 discharger's project M&RP shall include a description of the following items:

(1) Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

(2) Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program a copy of the Chain of Custody form used when handling and shipping samples.

[16] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394

[17] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

(3) Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section M.4.f above.

ii LUP Type 2 & 3 dischargers shall ensure that all sampling and sample preservation be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. All laboratory analyses shall be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses shall be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). The LUP discharger shall conduct its own field analysis of pH and may conduct its own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

j. <u>LUP Type 2 & 3 Analytical Methods</u>

LUP Type 2 & 3 dischargers shall refer to Table 5 above for test Methods, detection Limits, and reporting Units.

i **pH**: LUP Type 2 & 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or pH test kit. The LUP discharger shall record pH monitoring results on paper and retain these records in accordance with Section M.4.o, below.

ii **Turbidity**: LUP Type 2 & 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results shall be recorded in the site log book in Nephelometric Turbidity Units (NTU).

iii **Suspended sediment concentration (SSC)**: LUP Type 3 dischargers exceeding their NEL, shall perform SSC analysis using ASTM Method D3977-97.

iv **Bioassessment**: LUP Type 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

k. Watershed Monitoring Option

If an LUP Type 2 or 3 discharger is part of a qualified regional watershed-based monitoring program the LUP Type 2 or 3 discharger may be eligible for relief from the monitoring requirements in this Attachment. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program if it determines that the watershed-based monitoring program will provide information to determine each discharger's compliance with the requirements of this General Permit.

l. Particle Size Analysis for Risk Justification

LUP Type 2 & 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

m. NAL Exceedance Report

i In the event that any effluent sample exceeds an applicable NAL, the Regional Water Boards may require LUP Type 2 & 3 dischargers to submit NAL Exceedance Reports.

ii LUP Type 2 & 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

iii LUP Type 2 & 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the exceedance report is filed.

iv LUP Type 2 & 3 dischargers shall include in the NAL Exceedance Report:

(1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit"); and
(2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

(3) Description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

n. NEL Violation Report

i All LUP Type 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

ii In the event that a LUP Type 3 discharger has violated an applicable NEL, the discharger shall submit an NEL Violation Report to the State Water Board no later than 24 hours after the NEL exceedance has been identified.

iii The LUP Type 3 discharger shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity.

iv The LUP Type 3 discharger shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the violation report is filed.

v The LUP Type 3 discharger shall include in the NEL Violation Report:

(1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit"); and
(2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
(3) Description of the current on-site BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

vi Compliance Storm Exemption:
In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event (see Section F.2.c of this Attachment), the LUP Type 3 discharger shall report the on-site rain gauge and nearby governmental rain gauge readings for verification.

o. Monitoring Records

LUP Type 2 & 3 dischargers shall ensure that records of all storm water monitoring information and copies of all reports (including Annual Reports) required by this General Permit be retained for a period of at least three years. LUP Type 2 & 3 dischargers may retain records offsite and make them available upon request. These records shall include:

i The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge);

ii The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements;

iii The date and approximate time of analyses;

iv The individual(s) who performed the analyses;

v A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and all chain of custody forms;

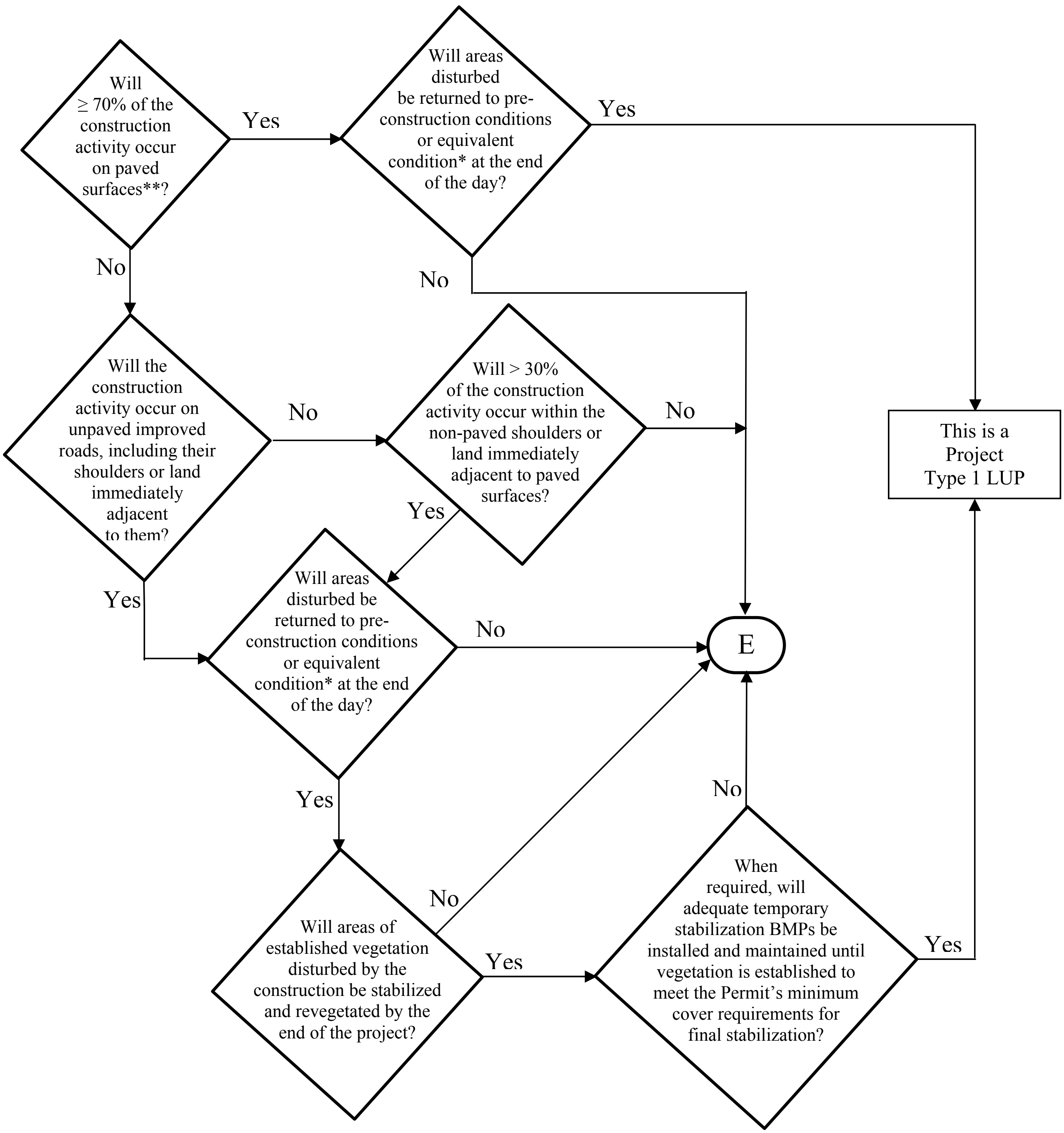
vi Quality assurance/quality control records and results;

vii Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Section M.4.a above);

viii Visual observation and sample collection exception records (see Section M.4.g above); and

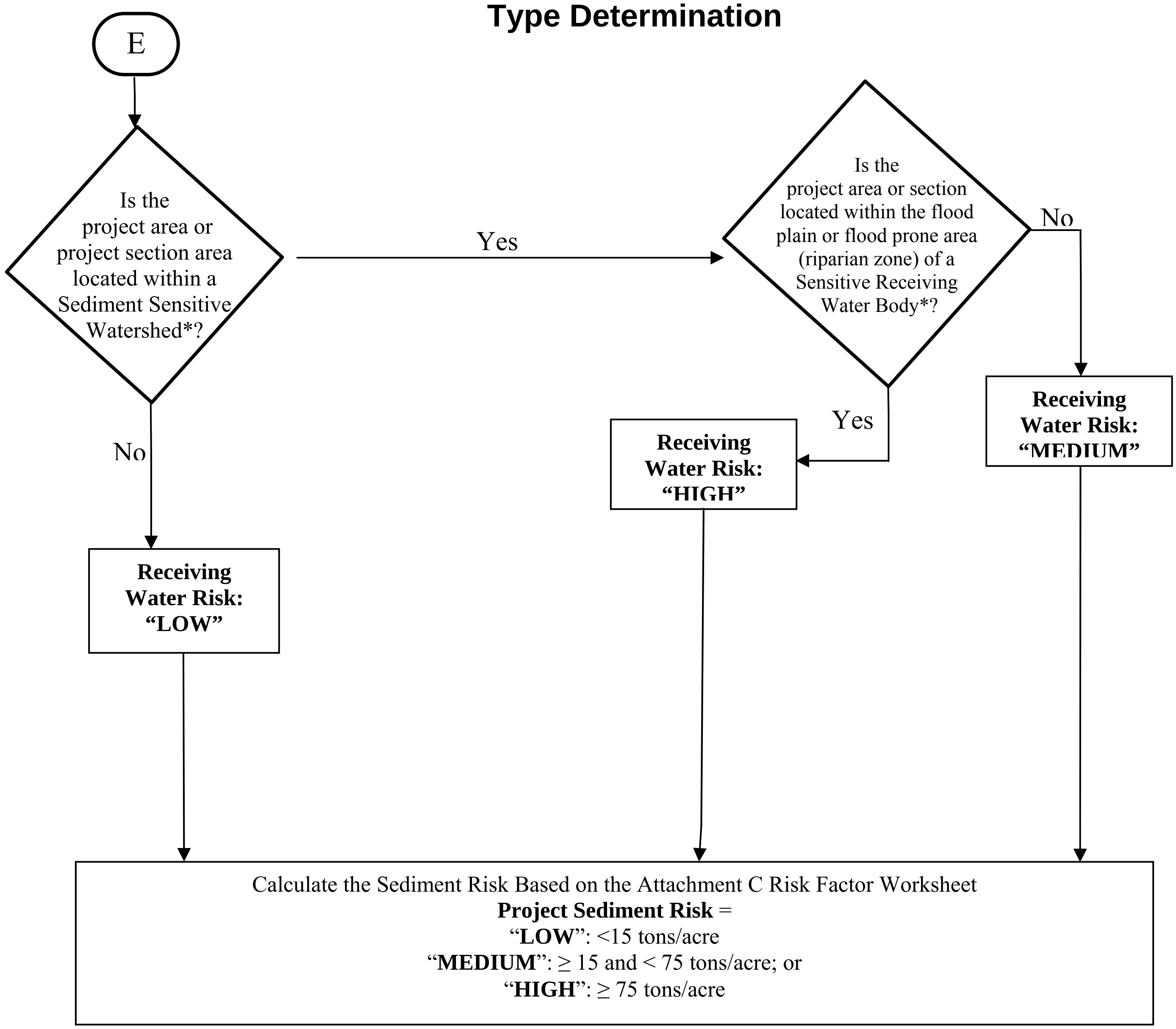
ix The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



*See Definition of Terms
** Or: "Will < 30% of the soil disturbance occur on unpaved surfaces?

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



* See Definition of Terms

PROJECT SEDIMENT RISK

RECEIVING WATER RISK	LOW	MEDIUM	HIGH
LOW	Type 1	Type 1	Type 2
MEDIUM	Type 1	Type 2	Type 3
HIGH	Type 2	Type 3	Type 3

ATTACHMENT A.1
Definition of Terms

1. **Equivalent Condition** – Means disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.
2. **Linear Construction Activity** – Linear construction activity consists of underground/ overhead facilities that typically include, but are not limited to, any conveyance, pipe or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/ tower pad and cable/ wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/ borrow locations.
3. **Sediment Sensitive Receiving Water Body –** Defined as a water body segment that is listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or is designated with beneficial uses of SPAWN, MIGRATORY, and COLD.
4. **Sediment Sensitive Watershed –** Defined as a watershed draining into a receiving water body listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or a water body designated with beneficial uses of SPAWN, MIGRATORY, and COLD.

ATTACHMENT A.2
PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS FOR LINEAR UNDERGROUND/OVERHEAD PROJECTS TO COMPLY WITH THE CONSTRUCTION GENERAL PERMIT

GENERAL INSTRUCTIONS

Who Must Submit

This permit is effective on July 1, 2010.

The Legally Responsible Person (LRP) for construction activities associated with linear underground/overhead project (LUP) must electronically apply for coverage under this General Permit on or after July 1, 2010. If it is determined that the LUP construction activities require an NPDES permit, the Legally Responsible Person[1] (LRP) shall submit PRDs for this General Permit in accordance with the following:

LUPs associated with Private or Municipal Development Projects

1. For LUPs associated with pre-development and pre-redevelopment construction activities:

   The LRP must obtain coverage[2] under this General Permit for its pre-development and pre-redevelopment construction activities where the total disturbed land area of these construction activities is greater than 1 acre.

2. For LUPs associated with new development and redevelopment construction projects:

   The LRP must obtain coverage under this General Permit for LUP construction activities associated with new development and redevelopment projects where the total disturbed land area of the LUP is greater than 1 acre. Coverage under this permit is not required where the same LUP construction activities are covered by another NPDES permit.

LUPs not associated with private or municipal new development or redevelopment projects:

The LRP must obtain coverage under this General Permit on or after July 1, 2010 for its LUP construction activities where the total disturbed land area is greater than 1 acre.

PRD Submittal Requirements

Prior to the start of construction activities a LRP must submit PRDs and fees to the State Water Board for each LUP.

New and Ongoing LUPs

Dischargers of new LUPs that commence construction activities after the adoption date of this General Permit shall file PRDs prior to the commencement of construction and implement the SWPPP upon the start of construction.

[1] person possessing the title of the land on which the construction activities will occur for the regulated site
[2] obtain coverage means filing PRDs for the project.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

Dischargers of ongoing LUPs that are currently covered under State Water Board Order No. 2003-0007 (Small LUP General Permit) shall electronically file Permit Registration Documents no later than July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 2003-0007-DWQ will be terminated. All existing dischargers shall be exempt from the risk determination requirements in Attachment A. All existing dischargers are therefore subject to LUP Type 1 requirements regardless of their project's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the risk determination requirements in Attachment A.

Where to Apply

The Permit Registration Documents (PRDs) can be found at
www.waterboards.ca.gov/water_issues/programs/stormwater/

Fees

The annual fee for storm water permits are established through the State of California Code of Regulations.

When Permit Coverage Commences

To obtain coverage under the General Permit, the LRP must include the complete PRDs and the annual fee. All PRDs deemed incomplete will be rejected with an explanation as to what is required to complete submittal. Upon receipt of complete PRDs and associated fee, each discharger will be sent a waste discharger's identification (WDID) number.

Projects and Activities Not Defined As Construction Activity

1. LUP construction activity does not include routine maintenance projects to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

- Maintain the original purpose of the facility, or hydraulic capacity.
- Update existing lines[3] and facilities to comply with applicable codes, standards and regulations regardless if such projects result in increased capacity.
- Repairing leaks.

Routine maintenance does not include construction of new[4] lines or facilities resulting from compliance with applicable codes, standards and regulations.

[3] Update existing lines includes replacing existing lines with new materials or pipes.
[4] New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must acquire new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement or agreement.

2. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

3. Tie-ins conducted immediately adjacent to “energized” or “pressurized” facilities by the discharger are not considered small construction activities where all other LUP construction activities associated with the tie-in are covered by a NOI and SWPPP of a third party or municipal agency.

Calculating Land Disturbance Areas of LUPs

The total land area disturbed for LUPs is the sum of the:

- Surface areas of trenches, laterals and ancillary facilities, plus
- Area of the base of stockpiles on unpaved surfaces, plus
- Surface area of the borrow area, plus
- Areas of paved surfaces constructed for the project, plus
- Areas of new roads constructed or areas of major reconstruction to existing roads (e.g. improvements to two-track surfaces or road widening) for the sole purpose of accessing construction activities or as part of the final project, plus
- Equipment and material storage, staging, and preparation areas (laydown areas) not on paved surfaces, plus
- Soil areas outside the surface area of trenches, laterals and ancillary facilities that will be graded, and/or disturbed by the use of construction equipment, vehicles and machinery during construction activities.

Stockpiling Areas

Stockpiling areas, borrow areas and the removal of soils from a construction site may or may not be included when calculating the area of disturbed soil for a site depending on the following conditions:

- For stockpiling of soils onsite or immediately adjacent to a LUP site and the stockpile is not on a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation.

- The surface area of borrow areas that are onsite or immediately adjacent to a project site are to be included in the disturbed area calculation.

- For soil that is hauled offsite to a location owned or operated by the discharger that is not a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

- For soil that is brought to the project from an off-site location owned or operated by the discharger the surface area of the borrow pit is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

- Trench spoils on a paved surface that are either returned to the trench or excavation or hauled away from the project daily for disposal or reuse will not be included in the disturbed area calculation.

If you have any questions concerning submittal of PRDs, please call the State Water Board at (866) 563-3107.

ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

GENERAL INSTRUCTIONS

A. All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A &B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Wavier requirements shall pay a fee of $200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
   a. Post-Construction Water Balance Calculator (Appendix 2).

2. Dischargers who are proposing to implement ATS shall submit:
   a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

b. Certification proof that design done by a professional in accordance with Attachment F.

3. Dischargers who are proposing an alternate Risk Justification:
   a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

1. Notice of Intent (NOI)

2. Site Map(s) Includes:
   a. The project's surrounding area (vicinity)
   b. Site layout
   c. Construction site boundaries
   d. Drainage areas
   e. Discharge locations
   f. Sampling locations
   g. Areas of soil disturbance (temporary or permanent)
   h. Active areas of soil disturbance (cut or fill)
   i. Locations of all runoff BMPs
   j. Locations of all erosion control BMPs
   k. Locations of all sediment control BMPs
   l. ATS location (if applicable)
   m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
   n. Locations of all post-construction BMPs
   o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices

3. **SWPPPs**
   A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.

4. **Risk Assessment**
   All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.

   a. The Standard Risk Assessment includes utilization of the following:
      i. Receiving water Risk Assessment interactive map

ii. EPA Rainfall Erosivity Factor Calculator Website
iii. Sediment Risk interactive map
iv. Sediment sensitive water bodies list

b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator

5. **Post-Construction Water Balance Calculator**
   All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.

6. **ATS Design Document and Certification**
   All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT C
RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 dischargers shall implement good housekeeping measures for <u>waste management</u>, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 dischargers shall implement good housekeeping for <u>vehicle storage and maintenance</u>, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 dischargers shall implement good housekeeping for <u>landscape materials</u>, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 1 dischargers shall conduct an assessment and create a list of <u>potential pollutant sources</u> and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.

2. Risk Level 1 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 1 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

    a. Inspection date and date the inspection report was written.

    b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

    c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

    d. A description of any BMPs evaluated and any deficiencies noted.

    e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

    f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

    g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

    h. Photographs taken during the inspection, if any.

    i. Inspector's name, title, and signature.

H. Rain Event Action Plan

Not required for Risk Level 1 dischargers.

I. Risk Level 1 Monitoring and Reporting Requirements

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

1. **Construction Site Monitoring Program Requirements**

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Programs to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions;

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and

d. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 1 - Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

   a. Risk Level 1 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

   b. Risk Level 1 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

   c. Risk Level 1 dischargers shall conduct visual observations (inspections) during business hours only.

   d. Risk Level 1 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

   e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 1 dischargers shall visually observe (inspect):

      i. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

      ii. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP. If needed, the discharger shall implement appropriate corrective actions.

iii. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in e.i and e.iii above, Risk Level 1 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 1 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 1 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 1 – Visual Observation Exemptions**

a. Risk Level 1 dischargers shall be prepared to conduct visual observation (inspections) until the minimum requirements of Section I.3 above are completed. Risk Level 1 dischargers are not required to conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required visual observations (inspections) are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations (inspections) were not conducted.

5. **Risk Level 1 – Monitoring Methods**

Risk Level 1 dischargers shall include a description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

6. **Risk Level 1 – Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

   i. Risk Level 1 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

   ii. Risk Level 1 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

   iii. Risk Level 1 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 1 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7. **Risk Level 1 – Non-Visible Pollutant Monitoring Requirements**

   a. Risk Level 1 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

   b. Risk Level 1 dischargers shall ensure that water samples are large enough to characterize the site conditions.

   c. Risk Level 1 dischargers shall collect samples at all discharge locations that can be safely accessed.

   d. Risk Level 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

   e. Risk Level 1 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 1 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 1 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[2]

h. Risk Level 1 dischargers shall keep all field /or analytical data in the SWPPP document.

8. **Risk Level 1 – Particle Size Analysis for Project Risk Justification**

Risk Level 1 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

9. **Risk Level 1 – Records**

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

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[2] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.6 above).

i. Visual observation and sample collection exception records (see Section I.4 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

   a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

   b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

   c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

   d. Cover waste disposal containers at the end of every business day and during a rain event.

   e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

   f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

   g. Implement procedures that effectively address hazardous and non-hazardous spills.

   h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

      i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for <u>vehicle storage and maintenance</u>, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for <u>landscape materials</u>, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of <u>potential pollutant sources</u> and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

	to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or

design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector’s name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall

ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase
   b. Trades active on the construction site during each construction phase
   c. Trade contractor information
   d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

Storm Water Effluent Monitoring Requirements

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. **Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent[4] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. **Risk Level 2 – Visual Observation and Sample Collection Exemptions**

a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk

[4] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 2 – Storm Water Sample Collection and Handling Instructions**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[5]

8. **Risk Level 2 – Monitoring Methods**

a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:

i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample

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[5] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml.

collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 2 – Analytical Methods**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. **Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements**

    a. Visual Monitoring Requirements:

       i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

       ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

       iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

    b. Effluent Sampling Locations:

       i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

       ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

       iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 2 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[6]

h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 2 – Watershed Monitoring Option**

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program

[6] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 2 – Particle Size Analysis for Project Risk Justification**

Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 2 – Records**

Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections;

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 2 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:

   i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit").

   ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

   iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1 NTU		250 NTU
		For ATS discharges	1 NTU		N/A

ATTACHMENT E
RISK LEVEL 3 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 3 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric –Risk Level 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU. In addition, Risk Level 3 dischargers are subject to a pH NEL of 6.0-9.0 and a turbidity NEL of 500 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 3 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 3 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 3 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protecting stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 3 dischargers shall implement good housekeeping for <u>vehicle storage and maintenance</u>, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 3 dischargers shall implement good housekeeping for <u>landscape materials</u>, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinuing the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 3 dischargers shall conduct an assessment and create a list of <u>potential pollutant sources</u> and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 3 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 3 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 3 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 3 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 3 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 3 dischargers shall implement effective wind erosion control.

2. Risk Level 3 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 3 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 3 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

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[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

8. **Additional Risk Level 3 Requirement:** The Regional Water Board may require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

F. Run-on and Run-off Controls

Risk Level 3 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 3 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 3 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 3 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 3 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 3 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

    a. Inspection date and date the inspection report was written.

    b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

    c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

    d. A description of any BMPs evaluated and any deficiencies noted.

    e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

    f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

    g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

    h. Photographs taken during the inspection, if any.

i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The QSP shall obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address.
   b. Calculated Risk Level (2 or 3).
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.

4. **Additional Risk Level 3 Requirement:** The QSP shall include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase.
   b. Trades active on the construction site during each construction phase.
   c. Trade contractor information.
   d. Suggested actions for each project phase.

5. **Additional Risk Level 3 Requirement:** The QSP shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

a. Site Address.
b. Calculated Risk Level (2 or 3).
c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.
f. Trades active on site during Inactive Construction.
g. Trade contractor information.
h. Suggested actions for inactive construction sites.

6. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 3 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
3	X	X	X	X	X	X	X[4]

1. Construction Site Monitoring Program Requirements

    a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

    b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Program in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

    c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

    The CSMP shall be developed and implemented to address the following objectives:

[4] When NEL exceeded

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 3 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 3 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 3 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 3 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 3 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 3 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i. and c.iii above, Risk Level 3 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 3 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 3 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 3 – Water Quality Sampling and Analysis**

a. Risk Level 3 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 3 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 3 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 3 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

e. Risk 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

f. Risk Level 3 discharger sites that have violated the turbidity daily average NEL shall analyze subsequent effluent samples for all the parameters specified in Section I.4.e, above, and Suspended Sediment Concentration (SSC).

<u>Receiving Water Monitoring Requirements</u>

g. In the event that a Risk Level 3 discharger violates an NEL contained in this General Permit and has a direct discharge into receiving waters, the Risk Level 3 discharger shall subsequently sample receiving waters (RWs) for all parameter(s) required in Section I.4.e above for the duration of coverage under this General Permit.

h. Risk Level 3 dischargers disturbing 30 acres or more of the landscape and with direct discharges into receiving waters shall conduct or participate in benthic macroinvertebrate bioassessment of RWs prior to commencement of construction activity (See Appendix 3).

i. Risk Level 3 dischargers shall obtain RW samples in accordance with the Receiving Water sampling location section (Section I.5), below.

5. **Risk Level 3 – Storm Water Discharge Water Quality Sampling Locations**

<u>Effluent Sampling Locations</u>

a. Risk Level 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 3 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 3 dischargers shall ensure that storm water discharge collected and observed represent[5] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 3 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 3 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 3 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

Receiving Water Sampling Locations

h. **Upstream/up-gradient RW samples**: Risk Level 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible and upstream from the effluent discharge point.

i. **Downstream/down-gradient RW samples**: Risk Level 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible and downstream from the effluent discharge point.

j. If two or more discharge locations discharge to the same receiving water, Risk Level 3 dischargers may sample the receiving water at a single upstream and downstream location.

[5] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment-laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment laden water even if most water flowing through the fence is clear.

6. **Risk Level 3 – Visual Observation and Sample Collection Exemptions**

   a. Risk Level 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 3 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

      i. During dangerous weather conditions such as flooding and electrical storms.

      ii. Outside of scheduled site business hours.

   b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 3 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 3 – Storm Water Sample Collection and Handling Instructions**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

   b. Risk Level 3 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

   c. Risk Level 3 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[6]

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[6] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml

8. **Risk Level 3 – Monitoring Methods**

   a. Risk Level 3 dischargers shall include a description of the following items in the CSMP:

      i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

      ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

      iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

   b. Risk Level 3 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger’s own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 3 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). Risk Level 3 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 3 – Analytical Methods**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 3 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

d. **Suspended sediment concentration (SSC)**: Risk Level 3 dischargers shall perform SSC analysis using ASTM Method D3977-97.

e. **Bioassessment**: Risk Level 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

10. **Risk Level 3 - Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

i. Risk Level 3 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

ii. Risk Level 3 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

iii. Risk Level 3 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 3 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

   i. Risk Level 3 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

   ii. Risk Level 3 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

   iii. Risk Level 3 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

11. **Risk Level 3 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 3 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 3 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 3 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 3 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 3 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 3 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[7]

h. Risk Level 3 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 3 – Watershed Monitoring Option**

Risk Level 3 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 3 – Particle Size Analysis for Project Risk Justification**

Risk Level 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 3 – Records**

Risk Level 3 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 3 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

[7] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 3 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity In this General Permit.

c. Risk Level 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 3 dischargers shall include in the NAL Exceedance Report:

   i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

16. **Risk Level 3 – NEL Violation Report**

a. Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

b. In the event that a discharger has violated an applicable NEL, Risk Level 3 dischargers shall submit an NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.

c. Risk Level 3 dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.

d. Risk Level 3 dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.

e. Risk Level 3 dischargers shall include in the NEL Violation Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”);

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

iii. A Description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

f. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, Risk level 3 discharger shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

17. **Risk Level 3 – Bioassessment**

a. Risk Level 3 dischargers with a total project-related ground disturbance exceeding 30 acres shall:

   i. Conduct bioassessment monitoring, as described in Appendix 3.

   ii. Include the collection and reporting of specified in stream biological data and physical habitat.

   iii. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).[8]

b. Risk Level 3 dischargers qualifying for bioassessment, where construction commences out of an index period for the site location shall:

   i. Receive Regional Board approval for the sampling exception.

   ii. Conduct bioassessment monitoring, as described in Appendix 3.

   iii. Include the collection and reporting of specified instream biological data and physical habitat.

   iv. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).

   OR

   v. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.

   vi. Send a copy of the check to the Regional Water Board office for the site's region.

   vii. Invest $**7,500.00 X The number of samples required** into the SWAMP program as compensation (upon regional board approval).

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[8] http://www.waterboards.ca.gov/water_issues/programs/swamp/.

Table 3 – Risk Level 3 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 3 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 3 Discharges other than ATS	1	NTU	250 NTU	500 NTU
		For ATS discharges	1 NTU		N/A	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample
SSC ASTM	Method D 3977-97[9]	Risk Level 3 (if NEL exceeded)	5 mg/L		N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[10] fixed-count of 600 org/sample	Risk Level 3 projects> 30 acres	N/A N/A		N/A	N/A

[9] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394.

[10] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

ATTACHMENT F:
Active Treatment System (ATS) Requirements

Table 1 – Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
Turbidity	EPA 0180.1 and/or field test with a calibrated portable instrument	For ATS discharges	1 NTU		N/A	10 NTU for Daily Flow-Weighted Average & 20 NTU for Any Single Sample

A. Dischargers choosing to implement an Active Treatment System (ATS) on their site shall comply with all of the requirements in this Attachment.

B. The discharger shall maintain a paper copy of each ATS specification onsite in compliance with the record retention requirements in the Special Provisions of this General Permit.

C. ATS Design, Operation and Submittals

1. The ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

2. The discharger shall ensure that the ATS is designed in a manner to preclude the accidental discharge of settled floc[1] during floc pumping or related operations.

3. The discharger shall design outlets to dissipate energy from concentrated flows.

4. The discharger shall install and operate an ATS by assigning a lead person (or project manager) who has either a minimum of five years construction storm

[1] Floc is defined as a clump of solids formed by the chemical action in ATS systems.

water experience or who is a licensed contractors specifically holding a California Class A Contractors license.[2]

5. The discharger shall prepare an ATS Plan that combines the site-specific data and treatment system information required to safely and efficiently operate an ATS. The ATS Plan shall be electronically submitted to the State Water Board at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation. At a minimum, the ATS Plan shall include:

    a. ATS Operation and Maintenance Manual for All Equipment.

    b. ATS Monitoring, Sampling & Reporting Plan, including Quality Assurance/Quality Control (QA/QC).

    c. ATS Health and Safety Plan.

    d. ATS Spill Prevention Plan.

6. The ATS shall be designed to capture and treat (within a 72-hour period) a volume equivalent to the runoff from a 10-year, 24-hour storm event using a watershed runoff coefficient of 1.0.

D. Treatment – Chemical Coagulation/Flocculation

1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003).

2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS.

3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics.

E. Residual Chemical and Toxicity Requirements

1. The discharger shall utilize a residual chemical test method that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold

[2] Business and Professions Code Division 3, Chapter 9, Article 4, Class A Contractor: A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill. [http://www.cslb.ca.gov/General-Information/library/licensing-classifications.asp].

concentration[3] (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used.

2. The discharger shall utilize a residual chemical test method that produces a result within one hour of sampling.

3. The discharger shall have a California State certified laboratory validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

4. If the discharger cannot utilize a residual chemical test method that meets the requirements above, the discharger shall operate the ATS in Batch Treatment[4] mode.

5. A discharger planning to operate in Batch Treatment mode shall perform toxicity testing in accordance with the following:

   a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge[5]. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[6]

   b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in “Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012” for Fathead minnow, *Pimephales promelas* (fathead minnow). Acute toxicity for *Oncorhynchus mykiss* (Rainbow Trout) may be used as a substitute for testing fathead minnows.

   c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

   d. The discharger shall electronically report all acute toxicity testing.

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[3] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:
The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

[4] Batch Treatment mode is defined as holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full.

[5] This requirement only requires that the test be initiated prior to discharge.

[6] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

F. Filtration

1. The ATS shall include a filtration step between the coagulant treatment train and the effluent discharge. This is commonly provided by sand, bag, or cartridge filters, which are sized to capture suspended material that might pass through the clarifier tanks.

2. Differential pressure measurements shall be taken to monitor filter loading and confirm that the final filter stage is functioning properly.

G. Residuals Management

1. Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.

2. Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.

H. ATS Instrumentation

1. The ATS shall be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate.

2. The minimum data recorded shall be consistent with the Monitoring and Reporting requirements below, and shall include:

    a. Influent Turbidity

    b. Effluent Turbidity

    c. Influent pH

    d. Effluent pH

    e. Residual Chemical

    f. Effluent Flow rate

    g. Effluent Flow volume

3. Systems shall be equipped with a data recording system, such as data loggers or webserver-based systems, which records each measurement on a frequency no longer than once every 15 minutes.

4. Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days continuous data.

5. Instrumentation systems shall be interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.

6. The system shall also assure that upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.

7. Instrumentation (flow meters, probes, valves, streaming current detectors, controlling computers, etc.) shall be installed and maintained per manufacturer's recommendations, which shall be included in the QA/QC plan.

8. The QA/QC plan shall also specify calibration procedures and frequencies, instrument method detection limit or sensitivity verification, laboratory duplicate procedures, and other pertinent procedures.

9. The instrumentation system shall include a method for controlling coagulant dose, to prevent potential overdosing. Available technologies include flow/turbidity proportional metering, periodic jar testing and metering pump adjustment, and ionic charge measurement controlling the metering pump.

I. ATS Effluent Discharge

1. ATS effluent shall comply with all provisions and prohibitions in this General Permit, specifically the NELs.

2. NELs for discharges from an ATS:

    a. Turbidity of all ATS discharges shall be less than 10 NTU for daily flow-weighted average of all samples and 20 NTU for any single sample.

    b. Residual Chemical shall be < 10% of MATC[7] for the most sensitive species of the chemical used.

3. If an analytical effluent sampling result is outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General

[7] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Permit and shall electronically file the results in violation within 24-hours of obtaining the results.

4. If ATS effluent is authorized to discharge into a sanitary sewer system, the discharger shall comply with any pre-treatment requirements applicable for that system. The discharger shall include any specific criteria required by the municipality in the ATS Plan.

5. Compliance Storm Event:

   Discharges of storm water from ATS shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10 year, 24 hour storm, as determined using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif

   This exemption is dependent on the submission of rain gauge data verifying the storm event is equal to or larger than the Compliance Storm.

J. Operation and Maintenance Plan

1. Each Project shall have a site-specific Operation and Maintenance (O&M) Manual covering the procedures required to install, operate and maintain the ATS.[8]

2. The O&M Manual shall only be used in conjunction with appropriate project-specific design specifications that describe the system configuration and operating parameters.

3. The O&M Manual shall have operating manuals for specific pumps, generators, control systems,and other equipment.

K. Sampling and Reporting Quality Assurance/ Quality Check (QA/QC) Plan

4. A project-specific QA/QC Plan shall be developed for each project. The QA/QC Plan shall include at a minimum:

   a. Calibration – Calibration methods and frequencies for all system and field instruments shall be specified.

   b. Method Detection Limits (MDLs) – The methods for determining MDLs shall be specified for each residual coagulant measurement method. Acceptable

[8] The manual is typically in a modular format covering generalized procedures for each component that is utilized in a particular system.

minimum MDLs for each method, specific to individual coagulants, shall be specified.

c. Laboratory Duplicates – Requirements for monthly laboratory duplicates for residual coagulant analysis shall be specified.

L. Personnel Training

1. Operators shall have training specific to using an ATS and liquid coagulants for storm water discharges in California.

2. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal.

3. Training shall include a minimum of eight hours classroom and 32 hours field training. The course shall cover the following topics:

   a. Coagulation Basics –Chemistry and physical processes

   b. ATS System Design and Operating Principles

   c. ATS Control Systems

   d. Coagulant Selection – Jar testing, dose determination, etc.

   e. Aquatic Safety/Toxicity of Coagulants, proper handling and safety

   f. Monitoring, Sampling, and Analysis

   g. Reporting and Recordkeeping

   h. Emergency Response

M. Active Treatment System (ATS) Monitoring Requirements

Any discharger who deploys an ATS on their site shall conduct the following:

1. Visual Monitoring

   a. A designated responsible person shall be on site daily at all times during treatment operations.

   b. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log.

i. The log shall include the name and phone number of the person responsible for system operation and monitoring.

ii. The log shall include documentation of the responsible person's training.

2. Operational and Compliance Monitoring

a. Flow shall be continuously monitored and recorded at not greater than 15-minute intervals for total volume treated and discharged.

b. Influent and effluent pH must be continuously monitored and recorded at not greater than 15-minute intervals.

c. Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at not greater than 15-minute intervals.

d. The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.

e. Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.

f. Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.

g. Effluent shall be monitored and recorded for residual chemical/additive levels.

h. If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

3. Toxicity Monitoring

A discharger operating in batch treatment mode shall perform toxicity testing in accordance with the following:

a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge.[9] All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[10]

[9] This requirement only requires that the test be initiated prior to discharge.
[10] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas or* Rainbow trout *Oncorhynchus mykiss* may be used as a substitute for fathead minnow.

c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.[11]

4. Reporting and Recordkeeping

At a minimum, every 30 days a LRP representing the discharger shall access the State Water Boards Storm Water Mulit-Application and Report Tracking system (SMARTS) and electronically upload field data from the ATS. Records must be kept for three years after the project is completed .

5. Non-compliance Reporting

a. Any indications of toxicity or other violations of water quality objectives shall be reported to the appropriate regulatory agency as required by this General Permit.

b. Upon any measurements that exceed water quality standards, the system operator shall immediately notify his supervisor or other responsible parties, who shall notify the Regional Water Board.

c. If any monitoring data exceeds any applicable NEL in this General Permit, the discharger shall electronically submit a NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.

i. ATS dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.

ii. ATS dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.

iii. ATS dischargers shall include in the NEL Violation Report:

(1) The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

[11] http://www.epa.gov/waterscience/methods/wet/.

(2) The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

(3) A description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

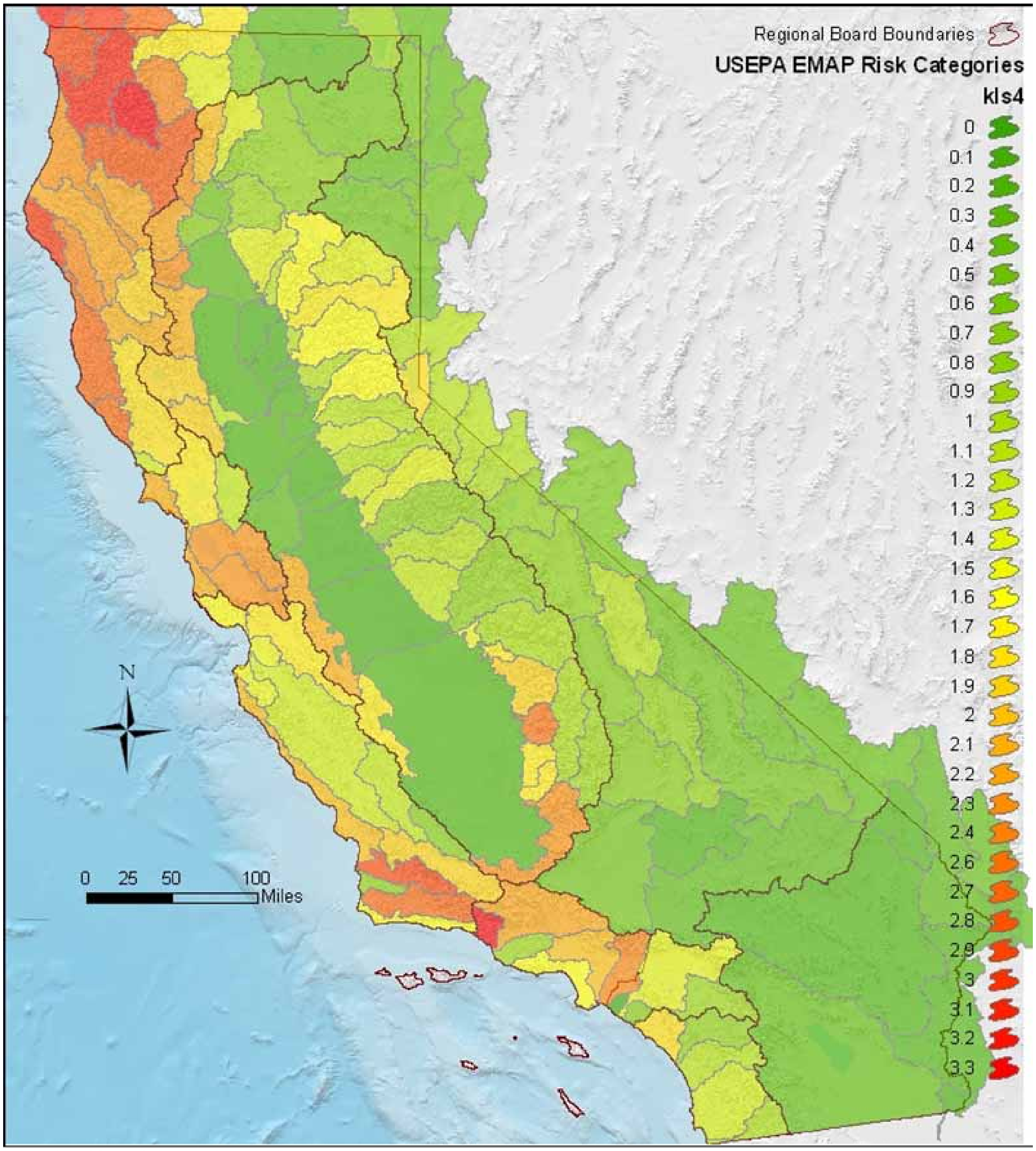
iv. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, ATS dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

Risk Determination Worksheet

Step 1	Determine Sediment Risk via one of the options listed: 1. GIS Map Method - EPA Rainfall Erosivity Calculator & GIS map 2. Individual Method - EPA Rainfall Erosivity Calculator & Individual Data
Step 2	Determine Receiving Water Risk via one of the options listed: 1. GIS map of Sediment Sensitive Watersheds provided (in development) 2. List of Sediment Sensitive Watersheds provided
Step 3	Determine Combined Risk Level

Sediment Risk Factor Worksheet	Entry
A) R Factor	
Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site. http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm	
R Factor Value	0
B) K Factor (weighted average, by area, for all site soils)	
The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted. Site-specific K factor guidance	
K Factor Value	0
C) LS Factor (weighted average, by area, for all slopes)	
The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction. LS Table	
LS Factor Value	0
Watershed Erosion Estimate (=RxKxLS) in tons/acre	0
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >=15 and <75 tons/acre High Sediment Risk: >= 75 tons/acre	**Low**

For the GIS Map Method, the R factor for the project is calculated using the online calculator at (see cell to right). The product of K and LS are shown on the figure below. To determine soil loss in tons per acre, multiply the R factor times the value for K times LS from the map.
http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm



Water Boards

State Water Resources Control Board, January 15, 2008

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment**? (For help with impaired waterbodies please check the attached worksheet or visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: 2006 Approved Sediment-impared WBs Worksheet http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp	**Yes**	**High**

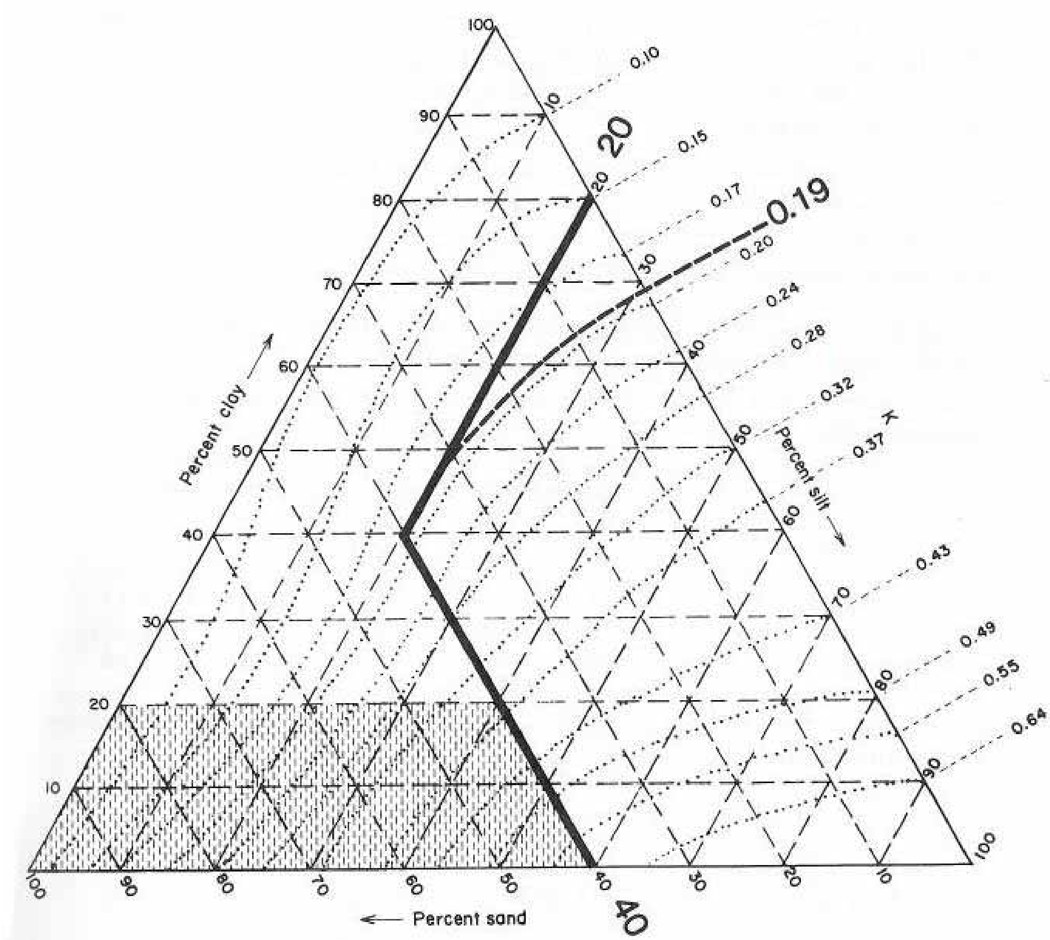
Combined Risk Level Matrix

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Sediment Risk</td></tr>
<tr><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td rowspan="2">Receiving Water Risk</td><td>Low</td><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><td>High</td><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

Project Sediment Risk:	**Low**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Erickson triangular nomograph used to estimate soil erodibility (K) factor.
The figure above is the USDA nomograph used to determine the K factor for a soil, based on its texture (% silt plus very fine sand, % sand, % organic matter, soil structure, and permeability).
Nomograph from Erickson 1977 as referenced in Goldman et. al., 1986.

Average Watershed Slope (%)

Sheet Flow Length (ft)	**0.2**	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**20.0**	
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	1
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	1
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	1
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	2
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	2

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE11530	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAR11111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	
CAR11111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR11111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2004	
CAR11141	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2004	
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2400	Silvicultural Point Sources	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11162	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR10511	1	North Coast	R	Rivers/Streams	Klamath River HU, Lower HA, Klamath Glen HSA	10511000	609	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	If this listing is determined to be on tribal lands, USEPA should place this water body and pollutant on the section 303d list for the tribal lands. It is not the State Water Board's inten this listing affect other actions related to decommissioning and removal of dams on the Klamath River
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	3210	Geothermal Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1100	Nonirrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3210	Geothermal Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1600	Intensive Animal Feeding Operations	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .

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CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	8050	Erosion From Derelict Land	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR30411	3	Central Coast	R	Rivers/Streams	San Vicente Creek	30411023	9.11953	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR31300	3	Central Coast	R	Rivers/Streams	Shuman Canyon Creek	31300041	8.5496	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR30413	3	Central Coast	R	Rivers/Streams	Valencia Creek	30413023	6.19	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2008	
CAR30413	3	Central Coast	R	Rivers/Streams	Valencia Creek	30413023	6.19	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1100	Nonirrigated Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1400	Pasture Grazing-Riparian and/or Upland	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1940	Dairies	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4100	Urban Runoff--Non-industrial Permitted	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.

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CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11433	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	11433000	122	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11433	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	11433000	122	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAB20114	2	San Francisco Bay	B	Bays and Harbors	Tomales Bay	20114033	8545.46	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2008	TMDL will be developed as part of ongoing watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring assessment needed.
CAB20114	2	San Francisco Bay	B	Bays and Harbors	Tomales Bay	20114033	8545.46	A	Acres	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2008	TMDL will be developed as part of ongoing watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring assessment needed.
CAR20240	2	San Francisco Bay	R	Rivers/Streams	Butano Creek	20240031	3.62774	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Impairment to steelhead habita
CAR20113	2	San Francisco Bay	R	Rivers/Streams	Lagunitas Creek	20113020	16.75	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAR20113	2	San Francisco Bay	R	Rivers/Streams	Lagunitas Creek	20113020	16.75	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20240	2	San Francisco Bay	R	Rivers/Streams	Pescadero Creek	20240013	26.03	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	If California Department of Fish and Game and the National Marine Fisheries Service find that for this water body fish populations are not impacted, the State Water Board supp removing this water body and pollutant from the list.
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR20550	2	San Francisco Bay	R	Rivers/Streams	San Francisquito Creek	20550040	12.05	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	Impairment to steelhead habita
CAR20230	2	San Francisco Bay	R	Rivers/Streams	San Gregorio Creek	20230014	11.14	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Impairment to steelhead habita
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20112	2	San Francisco Bay	R	Rivers/Streams	Walker Creek	20112013	15.8352	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7200	Dredging	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2015	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAE30413	3	Central Coast	E	Estuaries	Soquel Lagoon	30413014	1.15873	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2011	
CAR30413	3	Central Coast	R	Rivers/Streams	Aptos Creek	30413023	8.40589	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2008	
CAR30413	3	Central Coast	R	Rivers/Streams	Aptos Creek	30413023	8.40589	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2008	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR31300	3	Central Coast	R	Rivers/Streams	Casmalia Canyon Creek	31300040	4.96262	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR40422	4	Los Angeles	R	Rivers/Streams	Las Virgenes Creek	40422010	11.62	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR40421	4	Los Angeles	R	Rivers/Streams	Malibu Creek	40421000	10.85	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR40424	4	Los Angeles	R	Rivers/Streams	Medea Creek Reach 1 (Lake to Confl. with Lindero)	40424000	2.57	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR40312	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 2 (estuary to Potrero Rd was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	40312000	4.31213	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40312	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 2 (estuary to Potrero Rd was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	40312000	4.31213	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40312	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	40312000	3.46697	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40312	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	40312000	3.46697	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40311	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	40311000	7.18751	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40311	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	40311000	7.18751	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40361	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	40311000	4.34088	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40361	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 5 (was Beardsley Channel on 1998 303d list)	40311000	4.34088	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40362	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	40362000	15.2966	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40362	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	40362000	15.2966	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40362	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	40367000	13.9129	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40362	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	40367000	13.9129	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40367	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 8 (was Tapo Canyor Reach 1)	40366000	7.18869	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40364	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 11 (Arroyo Santa Rosa was part of Conejo Creek Reach 3 on 1998 303d list)	40365000	8.68888	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40364	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 11 (Arroyo Santa Rosa was part of Conejo Creek Reach 3 on 1998 303d list)	40365000	8.68888	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR40423	4	Los Angeles	R	Rivers/Streams	Medea Creek Reach 2 (Abv Confl. with Linderc	40423000	5.41	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR40424	4	Los Angeles	R	Rivers/Streams	Triunfo Canyon Creek Reach 1	40424000	2.51	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR40424	4	Los Angeles	R	Rivers/Streams	Triunfo Canyon Creek Reach 2	40424000	3.32	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR52641	5	Central Valley	R	Rivers/Streams	Fall River (Pit)	52641031	8.61219	M	Miles	1100	Sedimentation/Siltation	2105	Historical Land Management Activities	2016	The sedimentation is accumulated sand size sediment in the upper Fall River. The historic land management activities include logging, grazing, channelization, roads, and railroads.
CAR51732	5	Central Valley	R	Rivers/Streams	Humbug Creek	51732030	2.20272	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2012	All resource extraction sources are abandoned mine
CAR55911	5	Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2007	
CAR55911	5	Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2007	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR55911	5	Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2007	
CAL63030(	6	Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2006	
CAL63030(	6	Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2006	
CAL63030(	6	Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2006	
CAL63030(	6	Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	8540	Sediment Resuspension	2006	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	2000	Silviculture	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	3200	Land Development	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4600	Urban Runoff--Erosion and Sedimentation	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7100	Channelization	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8100	Atmospheric Deposition	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8540	Sediment Resuspension	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8600	Natural Sources	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2007	
CAL63430(	6	Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2007	
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8100	Atmospheric Deposition	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420	6	Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63520	6	Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Watershed disturbance in naturally highly erosive watershe
CAR63520	6	Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Watershed disturbance in naturally highly erosive watershe
CAR63520	6	Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Watershed disturbance in naturally highly erosive watershe
CAR63040	6	Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63040	6	Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63040	6	Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63010	6	Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2019	
CAR63010	6	Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2019	
CAR63010	6	Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	4600	Urban Runoff--Erosion and Sedimentation	2019	
CAR63010	6	Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	
CAR63010	6	Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR63520	6	Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63520	6	Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63520	6	Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2019	
CAR63410	6	Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR63030	6	Lahontan	R	Rivers/Streams	Hot Springs Canyon Creek	63030042	2.8612	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2008	Listed on basis of limited data; further monitoring may support delistir
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2006	
CAR63520	6	Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510	6	Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2008	
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2008	
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2008	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2008	
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2008	
CAR63420	6	Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	
CAR63210	6	Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	
CAR63210	6	Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR63210	6	Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAL80171(	8	Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	
CAL80171(	8	Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	
CAL80171(	8	Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	9105	Unknown Nonpoint Source	2006	
CAR80171	8	Santa Ana	R	Rivers/Streams	Rathbone (Rathbun) Creek	80171000	4.68	M	Miles	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	
CAR80171	8	Santa Ana	R	Rivers/Streams	Rathbone (Rathbun) Creek	80171000	4.68	M	Miles	1100	Sedimentation/Siltation	9105	Unknown Nonpoint Source	2006	
CAE90431	9	San Diego	E	Estuaries	Agua Hedionda Lagoor	90431000	6.83187	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE90421	9	San Diego	E	Estuaries	Buena Vista Lagoor	90421000	202.298	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE90610	9	San Diego	E	Estuaries	Los Penasquitos Lagoor	90610000	468.918	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE90461	9	San Diego	E	Estuaries	San Elijo Lagoor	90461000	565.804	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	Estimated size of impairment is 150 acres

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.

(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below

(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.

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(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.

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Project Information	
Project Name:	*Optional*
Waste Discharge Identification (WDID):	*Optional*
Date:	*Optional*
Sub Drainage Area Name (from map):	*Optional*

Runoff Calculations		
(Step 2) Indicate the Soil Type (dropdown menu to right):	*Group C Soils*	**Low infiltration. Sandy clay loam. Infiltration rate 0.05 to 0.15 inch/hr when wet.**
(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	*Wood & Grass: <50% ground cover*	
(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	*Lawn, Grass, or Pasture covering more than 75% of the open space*	

	Complete Either		
	Sq Ft	Acres	Acres
(Step 5) Total Project Site Area:		5.00	5.00
(Step 6) Sub-watershed Area:		5.00	5.00
Percent of total project :			100%

Runoff Curve Numbers	
Existing Pervious Runoff Curve Number	**82**
Proposed Development Pervious Runoff Curve Number	**74**

Design Storm		
Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.62**	**in**
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.44**	**In**
P used for calculations (in) (the greater of the above two criteria)	**0.62**	**In**
^Available at www.cabmphandbooks.com		

(Step 7) Sub-watershed Conditions	Complete Either		Calculated Acres
Sub-watershed Area (acres)	Sq Ft	Acres	5.00
Existing Rooftop Impervious Coverage		0	0.00
Existing Non-Rooftop Impervious Coverage		0	0.00
Proposed Rooftop Impervious Coverage		0	0.00
Proposed Non-Rooftop Impervious Coverage		0	0.00

Credits	Acres	Square Feet
Porous Pavement	0.00	0
Tree Planting	0.00	0
Downspout Disconnection	0.00	0
Impervious Area Disconnection	0.00	0
Green Roof	0.00	0
Stream Buffer	0.00	0
Vegetated Swales	0.00	0
Subtotal	0.00	0
Subtotal Runoff Volume Reduction Credit	0 Cu. Ft.	

Pre-Project Runoff Volume (cu ft)	**247**	**Cu.Ft.**
Project-Related Runoff Volume Increase w/o credits (cu ft)	**0**	**Cu.Ft.**
Project-Related Volume Increase with Credits (cu ft)	**0**	**Cu.Ft.**

You have achieved your minimum requirements

(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	0 Cu. Ft.
Soil Quality	0 Cu. Ft.
Subtotal Runoff Volume Reduction	0 Cu. Ft.
Total Runoff Volume Reduction Credit	0 Cu. Ft.

Porous Pavement Credit Worksheet

Please fill out a porous pavement credit worksheet for each project sub-watershed.

For the PROPOSED Development:

Proposed Porous Pavement	Runoff Reduction*	Fill in either Acres or SqFt: In SqFt.	In Acres	Equivalent Acres
Area of **Brick without Grout** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Brick without Grout** on more than 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.30			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.60			0.00
Area of **Reinforced Grass Pavement** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Reinforced Grass Pavement** on at least 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Porous Gravel Pavement** on less than 12 inches of base with at least 20% void space over soil	0.38			0.00
Area of **Porous Gravel Pavement** on at least 12 inches of base with at least 20% void space over soil	0.75			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with less than 4 inches of gravel base (washed stone)	0.40			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 4 to 8 inches of gravel base (washed stone)	0.60			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 8 to 12 inches of gravel base (washed stone)	0.80			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 12 or more inches of gravel base (washed stone)	1.00			0.00

*=1-Rv** Return to Calculator

**Using Site Design Techniques to meet Development Standards for Stormwater Quality (BASMAA 2003)

**NCDENR Stormwater BMP Manual (2007)

Tree Planting Credit Worksheet

Please fill out a tree canopy credit worksheet for each project sub-watershed.

Tree Canopy Credit Criteria	Number of Trees Planted	Credit (acres)	
Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*	0	0.00	
Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*		0.00	
	Square feet Under Canopy		
Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.		0.00	
Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.		0.00	0
Please describe below how the project will ensure that these trees will be maintained.			

Return to Calculator

* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions

Downspout Disconnection Credit Worksheet
Please fill out a downspout disconnection credit worksheet for each project subwatershed. If you answer yes to all questions, all rooftop area draining to each downspout will be subtracted from your proposed rooftop impervious coverage.

Downspout Disconnection Credit Criteria					
Do downspouts and any extensions extend at least six feet from a basement and two feet from a crawl space or concrete slab?				○ Yes	◉ No
Is the area of rooftop connecting to each disconnected downspout 600 square feet or less?				○ Yes	◉ No
Is the roof runoff from the design storm event fully contained in a raised bed or planter box or does it drain as sheet flow to a landscaped area large enough to contain the roof runoff from the design storm event?				○ Yes	◉ No
The Stream Buffer and/or Vegetated Swale credits **will not** be taken in this sub-watershed area?				○ Yes	◉ No
Percentage of existing	0.00	Acres	of rooftop surface has disconnected downspouts		
Percentage of the proposed	0.00	Acres	of rooftop surface has disconnected downspouts	50	
				Return to Calculator	

Impervious Area Disconnection Credit Worksheet

Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.

Non-Rooftop Disconnection Credit Criteria	Response
Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?	◉ Yes ○ No
Is the impervious area to any one discharge location less than 5,000 square feet?	◉ Yes ○ No
The Stream Buffer credit **will not** be taken in this sub-watershed area?	◉ Yes ○ No

Percentage of existing	0.00	Acres non-rooftop surface area disconnected	
Percentage of the proposed	0.00	Acres non-rooftop surface area disconnected	70

Return to Calculator

Green Roof Credit Worksheet

Please fill out a greenroof credit worksheet for each project sub-watershed. If you answer yes to all questions, 70% of the greenroof area will be subtracted from your proposed rooftop impervious coverage.

Green Roof Credit Criteria	Response
Is the roof slope less than 15% or does it have a grid to hold the substrate in place until it forms a thick vegetation mat?	◉ Yes ○ No
Has a professional engineer assessed the necessary load reserves and designed a roof structure to meet state and local codes?	◉ Yes ○ No
Is the irrigation needed for plant establishment and/or to sustain the green roof during extended dry periods, is the source from stored, recycled, reclaimed, or reused water?	◉ Yes ○ No
Percentage of existing 0.00 Acres rooftop surface area in greenroof	
Percentage of the proposed 0.00 Acres rooftop surface area in greenroof	

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Stream Buffer Credit Worksheet

Please fill out a stream buffer credit worksheet for each project sub-watershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout and/or Impervious Area Disconnection credits.

Stream Buffer Credit Criteria				Response
Does runoff enter the floodprone width* or within 500 feet (whichever is larger) of a stream channel as sheet flow**?				○ Yes ◉ No
Is the contributing overland slope 5% or less, or if greater than 5%, is a level spreader used?				○ Yes ◉ No
Is the buffer area protected from vehicle or other traffic barriers to reduce compaction?				○ Yes ◉ No
Will the stream buffer be maintained in an ungraded and uncompacted condition and will the vegetation be maintained in a natural condition?				○ Yes ◉ No
Percentage of existing	0.00	Acres	impervious surface area draining into a stream buffer:	
Percentage of the proposed	0.00	Acres	impervious surface area that will drain into a stream buffer:	
Please describe below how the project will ensure that the buffer areas will remain in ungraded and uncompacted condition and that the vegetation will be maintained in a natural condition.				

Return to Calculator

* floodprone width is the width at twice the bankfull depth.
** the maximum contributing length shall be 75 feet for impervious area

Vegetated Swale Credit Worksheet

Please fill out a vegetated swale worksheet for each project subwatershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout Disconnection credit.

Vegetated Swale Credit Criteria

Have all vegetated swales been designed in accordance with Treatment Control BMP 30 (TC-30 - Vegetated Swale) from the California Stormwater BMP Handbook, New Development and Redevelopment (available at www.cabmphandbooks.com)?	○ Yes ◉ No
Is the maximum flow velocity for runoff from the design storm event less than or equal to 1.0 foot per second?	○ Yes ◉ No

Percentage of existing	0.00	Acres of impervious area draining to a vegetated swale	
Percentage of the proposed	0.00	Acres of impervious area draining to a vegetated swale	

Return to Calculator

Rain Barrel/Cistern Credit Worksheet

Please fill out a rain barrel/cistern worksheet for each project sub-watershed.

Rain Barrel/Cistern Credit Criteria	Response
Total number of rain barrel(s)/cisterns	
Average capacity of rain barrel(s)/cistern(s) (in gallons)	
Total capacity rain barrel(s)/cistern(s) (in cu ft) [1]	0

[1] accounts for 10% loss

Return to Calculator

Please fill out a soil quality worksheet for each project sub-watershed.

	Response
Will the landscaped area be lined with an impervious membrane?	
Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below? [1]	○ Yes ◉ No
If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.	1.3
If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).	Sandy loams, loams
What is the average depth of your landscaped soil media meeting the above criteria (inches)?	12
What is the total area of the landscaped areas meeting the above criteria (in acres)?	2.97

Return to Calculator

Table 1

Sands, loamy sands	<1.6
Sandy loams, loams	<1.4
Sandy clay loams, loams, clay loams	<1.4
Silts, silt loams	<1.3
Silt loams, silty clay loams	<1.1
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1
Clays (>45% clay)	<1.1

[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000. http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf

* To determine how to calculate density see: http://www.globe.gov/tctg/bulkden.pdf?sectionID=94

Porosity (%) 50.94%

Mineral grains in many soils are mainly quartz and feldspar, so 2.65 a good average for particle density. To determine percent porosity, use the formula: Porosity (%) = (1-Bulk Density/2.65) X 100

APPENDIX 2:
Post-Construction Water Balance Performance Standard Spreadsheet

The discharger shall submit with their Notice of Intent (NOI) the following information to demonstrate compliance with the New and Re-Development Water Balance Performance Standard.

Map Instructions

The discharger must submit a small-scale topographic map of the site to show the existing contour elevations, pre- and post-construction drainage divides, and the total length of stream in each watershed area. Recommended scales include 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in = 50 ft. The suggested contour interval is usually 1 to 5 feet, depending upon the slope of the terrain. The contour interval may be increased on steep slopes. Other contour intervals and scales may be appropriate given the magnitude of land disturbance.

Spreadsheet Instructions

The intent of the spreadsheet is to help dischargers calculate the project-related increase in runoff volume and select impervious area and runoff reduction credits to reduce the project-related increase in runoff volume to pre-project levels.

The discharger has the option of using the spreadsheet (**Appendix 2.1)** or a more sophisticated, watershed process-based model (e.g. Storm Water Management Model, Hydrological Simulation Program Fortran) to determine the project-related increase in runoff volume.

In* Appendix 4.1**, ***you must complete the worksheet for each land use/soil type combination for each project sub-watershed.

Steps 1 through 9 pertain specifically to the Runoff Volume Calculator:

Step 1: Enter the county where the project is located in cell H3.

Step 2: Enter the soil type in cell H6.

Step 3: Enter the existing pervious (dominant) land use type in cell H7.

Step 4: Enter the proposed pervious (dominant) land use type in cell H8.

Step 5: Enter the total project site area in cell H11 or J11.

Step 6: Enter the sub-watershed area in cell H12 or J12.

Step 7: Enter the existing rooftop area in cell H17 or J17, the existing non-rooftop impervious area in cell H18 or J18, the proposed rooftop area in cell H19 or J19, and the proposed non-rooftop impervious area in cell H20 or J20

Step 8: Work through each of the impervious area reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Step 9: Work through each of the impervious volume reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Non-structural Practices Available for Crediting

- ***Porous Pavement***
- ***Tree Planting***
- ***Downspout Disconnection***
- ***Impervious Area Disconnection***
- ***Green Roof***
- ***Stream Buffer***
- ***Vegetated Swales***
- ***Rain Barrels and Cisterns***
- ***Landscaping Soil Quality***

APPENDIX 3
Bioassessment Monitoring Guidelines

Bioassessment monitoring is required for projects that meet all of the following criteria:

1. The project is rated Risk Level 3 or LUP Type 3
2. The project directly discharges runoff to a freshwater wadeable stream (or streams) that is either: (a) listed by the State Water Board or USEPA as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or have the beneficial use SPAWN & COLD & MIGRATORY
3. Total project-related ground disturbance exceeds 30 acres.

For all such projects, the discharger shall conduct bioassessment monitoring, as described in this section, to assess the effect of the project on the biological integrity of receiving waters.
Bioassessment shall include:

1. The collection and reporting of specified instream biological data
2. The collection and reporting of specified instream physical habitat data

Bioassessment Exception
If a site qualifies for bioassessment, but construction commences out of an index period for the site location, the discharger shall:

1. Receive Regional Water Board approval for the sampling exception
2. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.
3. Send a copy of the check to the Regional Water Board office for the site's region
4. Invest **7,500.00 X The number of samples required** into the SWAMP program as compensation (upon Regional Water Board approval).
5. Conduct bioassessment monitoring, as described in Appendix 4
6. Include the collection and reporting of specified instream biological data and physical habitat
7. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP)

Site Locations and Frequency
Macroinvertebrate samples shall be collected both before ground disturbance is initiated and after the project is completed. The "after" sample(s) shall be collected after at least one winter season resulting in surface runoff has transpired after project-related ground disturbance has ceased. "Before" and "after" samples shall be collected both upstream and downstream of the project's

discharge. Upstream samples should be taken immediately before the sites outfall and downstream samples should be taken immediately after the outfall (when safe to collect the samples). Samples should be collected for each freshwater wadeable stream that is listed as impaired due to sediment, or tributary to a water body that is listed for sediment. Habitat assessment data shall be collected concurrently with all required macroinvertebrate samples.

Index Period (Timing of Sample Collection)
Macroinvertebrate sampling shall be conducted during the time of year (i.e., the "index period") most appropriate for bioassessment sampling, depending on ecoregion. This map is posted on the State Water Board's Website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Field Methods for Macroinvertebrate Collections
In collecting macroinvertebrate samples, the discharger shall use the "Reachwide Benthos (Multi-habitat) Procedure" specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007).[1]

Physical - Habitat Assessment Methods
The discharger shall conduct, concurrently with all required macroinvertebrate collections, the "Full" suite of physical habitat characterization measurements as specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007), and as summarized in the Surface Water Ambient Monitoring Program's *Stream Habitat Characterization Form — Full Version*.

Laboratory Methods
Macroinvertebrates shall be identified and classified according to the Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (SAFIT),[2] and using a fixed-count of 600 organisms per sample.

Quality Assurance
The discharger or its consultant(s) shall have and follow a quality assurance (QA) plan that covers the required bioassessment monitoring. The QA plan shall include, or be supplemented to include, a specific requirement for external QA checks (i.e., verification of taxonomic identifications and correction of data where errors are identified). External QA checks shall be performed on one of the

[1] This document is available on the Internet at: http://www.swrcb.ca.gov/swamp/docs/phab_sopr6.pdf.
[2] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

discharger's macroinvertebrate samples collected per calendar year, or ten percent of the samples per year (whichever is greater). QA samples shall be randomly selected. The external QA checks shall be paid for by the discharger, and performed by the California Department of Fish and Game's Aquatic Bioassessment Laboratory. An alternate laboratory with equivalent or better expertise and performance may be used if approved in writing by State Water Board staff.

Sample Preservation and Archiving

The original sample material shall be stored in 70 percent ethanol and retained by the discharger until: 1) all QA analyses specified herein and in the relevant QA plan are completed; and 2) any data corrections and/or re-analyses recommended by the external QA laboratory have been implemented. The remaining subsampled material shall be stored in 70 percent ethanol and retained until completeness checks have been performed according to the relevant QA plan. The identified organisms shall be stored in 70 percent ethanol, in separate glass vials for each final ID taxon. (For example, a sample with 45 identified taxa would be archived in a minimum of 45 vials, each containing all individuals of the identified taxon.) Each of the vials containing identified organisms shall be labeled with taxonomic information (i.e., taxon name, organism count) and collection information (i.e., site name/site code, waterbody name, date collected, method of collection). The identified organisms shall be archived (i.e., retained) by the discharger for a period of not less than three years from the date that all QA steps are completed, and shall be checked at least once per year and "topped off" with ethanol to prevent desiccation. The identified organisms shall be relinquished to the State Water Board upon request by any State Water Board staff.

Data Submittal

The macroinvertebrate results (i.e., taxonomic identifications consistent with the specified SAFIT STEs, and number of organisms within each taxa) shall be submitted to the State Water Board in electronic format. The State Water Board's Surface Water Ambient Monitoring Program (SWAMP) is currently developing standardized formats for reporting bioassessment data. All bioassessment data collected after those formats become available shall be submitted using the SWAMP formats. Until those formats are available, the biological data shall be submitted in MS-Excel (or equivalent) format.[3]

The physical/habitat data shall be reported using the standard format titled *SWAMP Stream Habitat Characterization Form — Full Version*.[4]

[3] Any version of Excel, 2000 or later, may be used.
[4] Available at:
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/fieldforms_fullversion052908.pdf

Invasive Species Prevention

In conducting the required bioassessment monitoring, the discharger and its consultants shall take precautions to prevent the introduction or spread of aquatic invasive species. At minimum, the discharger and its consultants shall follow the recommendations of the California Department of Fish and Game to minimize the introduction or spread of the New Zealand mudsnail.[5]

[5] Instructions for controlling the spread of NZ mudsnails, including decontamination methods, can be found at: http://www.dfg.ca.gov/invasives/mudsnail/
More information on AIS More information on AIS
http://www.waterboards.ca.gov/water_issues/programs/swamp/ais/

Appendix 4 Sediment TMDLs

Implemented Sediment TMDLs in California. Construction was listed as a source in all fo these TMDLs in relation to road construction. Although construction was mentioned as a source, it was not given a specific allocation amount. The closest allocation amount would be for the road activity management WLA. **Implementation Phase** – Adoption process by the Regional Board, the State Water Resources Control Board, the Office of Administrative Law, and the US Environmental Protection Agency completed and TMDL being implemented.

A. Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.albionfinaltmdl	R	Albion River	Sedimentation	Road Construction	2001	43 acres	See A (table 6)

B Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelR-middle.mainSed.temp	R	Middle Main Eel River and Tributaries (from Dos Rios to the South Fork)	Sedimentation	Road Construction	2005-2006	521 mi^2	100

C Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelRsouth.sed.temp	R	South Fork Eel River	Sedimentation	Road Construction	12 1999	See chart	473

D Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.bigfinaltmdl	R Big	River	Sedimentation	Road Construction	12 2001	181 mi^2 watershed drainage	TMDL = loading capacity = nonpoint sources + background =

							393 t mi2 yr

E Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelR-lower.Sed.temp-121807-signed	R	Lower Eel River	Sedimentation	Road Construction	12 2007	300 square-mile watershed	898

F Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelR-middle.Sed.temp-	R	Middle Fork Eel River	Sedimentation	Road Construction	12 2003	753 mi^2 (approx. 482,000 acres)	82

G Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** Mi^2	**WLA** tons mi^2 yr
1 R1.epa.EelRnorth-Sed.temp.final-121807-signed	R	North Fork Eel River	Sedimentation	Road Construction	12 30 2002	289 (180,020 acres)	20

H Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** Mi^2	**WLA** tons mi^2 yr
1 R1.epa.EelR-upper.mainSed.temp-	R	Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury)	Sedimentation	Road Construction	12 29 2004	688 (approx. 440,384 acres)	14

I Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.gualalafinaltmdl	R	Gualala River	Sedimentation	Road Construction	Not sure	300 (191,145 acres)	7

J Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.Mad-sed.turbidity	R	Mad River	Sedimentation	Road Construction	12 21 2007	480	174

K Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.mattole.sediment	R	Mattole River	Sedimentation	Road Construction	12 30 2003	296	27 or 520+27 = 547

L Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.navarro.sed.temp	R	Navarro River	Sedimentation	Road Construction	Not sure	315 (201,600 acres).	50

M Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.noyo.sediment	R	Noyo River	Sedimentation	Road Construction	12 16 1999	113 (72,323 acres)	68 (three areas measured) Table 16 in the TMDL

N Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.RedwoodCk.sed	Cr	Redwood Creek	Sedimentation	Road Construction	12 30 1998	278	1900 Total allocation

O Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA – Roads tons mi^2 yr
1 R1.epa.tenmile.sed	R	Ten Mile River	Sedimentation	Road Construction	2000	120	9

P Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA management tons mi^2 yr
1 R1.epa.trinity.sed	R	Trinity River	Sedimentation	Road Construction	12 20 2001	2000 of 3000 covered in this TMDL	See rows below
1	Cr	Horse Linto Creek	Sedimentation	Road Construction	12 20 2001	64	528
1	Cr	Mill creek and Tish Tang	Sedimentation	Road Construction	12 20 2001	39	210
1	Cr	Willow Creek	Sedimentation	Road Construction	12 20 2001	43	94
1	Cr	Campbell Creek and Supply Creek	Sedimentation	Road Construction	12 20 2001	11	1961
1	Cr	Lower Mainstem and Coon Creek	Sedimentation	Road Construction	12 20 2001	32	63
1 R		Reference Subwatershed [1]	Sedimentation	Road Construction	12 20 2001	434	24
1	Cr	Canyon Creek	Sedimentation	Road	12 20 2001	64	326

				Construction			
1 R		Upper Tributaries[2]	Sedimentation	Road Construction	12 20 2001	72	67
1 R		Middle Tributaries[3]	Sedimentation	Road Construction	12 20 2001	54	53
1 R		Lower Tributaries[4]	Sedimentation	Road Construction	12 20 2001	96	55
1	Cr	Weaver and Rush Creeks	Sedimentation	Road Construction	12 20 2001	72	169
1 Cr		Deadwood Creek Hoadley Gulch Poker Bar	Sedimentation	Road Construction	12 20 2001	47	68
1	L	Lewiston Lake	Sedimentation	Road Construction	12 20 2001	25	49
1 Cr		Grassvalley Creek	Sedimentation	Road Construction	12 20 2001	37	44
1	Cr	Indian Creek	Sedimentation	Road Construction	12 20 2001	34	81
1	Cr	Reading and Browns Creek	Sedimentation	Road Construction	12 20 2001	104	66
1 Cr		Reference Subwatersheds[5]	Sedimentation	Road Construction	12 20 2001	235	281
1	L, Cr	Westside tributaries[6]	Sedimentation	Road Construction	12 20 2001	93	105
1 R,	Cr, G	Upper trinity[7]	Sedimentation	Road Construction	12 20 2001	161	690
1 R,	Cr, G	East Fork Tributaries[8]	Sedimentation	Road Construction	12 20 2001	115	65
1	R, L	Eastside Tributaries[9]	Sedimentation	Road Construction	12 20 2001	89	60

1 New River, Big French, Manzanita, North Fork, East Fork, North Fork
2 Dutch, Soldier, Oregon gulch, Conner Creek
3 Big Bar, Prairie Creek, Little French Creek
4 Swede, Italian, Canadian, Cedar Flat, Mill, McDonald, Hennessy, Quimby, Hawkins, Sharber
5 Stuarts Fork, Swift Creek, Coffee Creek
6 Stuart Arm, Stoney Creek, Mule Creek, East Fork, Stuart Fork, West Side Trinity Lake, Hatchet Creek, Buckeye Creek,
7 Upper Trinity River, Tangle Blue, Sunflower, Graves, Bear Upper Trinity Mainstream, Ramshorn Creek, Ripple Creek, Minnehaha Creek, Snowslide Gulch, Scorpion Creek
8 East Fork Trinity, Cedar Creek, Squirrel Gulch

9 East Side Tributaries, Trinity Lake

Q Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.trinity.so.sed	R, Cr	South Fork Trinity River and Hayfork Creek	Sedimentation	Road Construction	12 1998	Not given, 19 miles long	33 (road total)

R Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.vanduzen.sed	R, Cr	Van Duzen River and Yager Creek	Sedimentation	Various	12 16 1999	429	1353 total allocation
1		Upper Basin	Sedimentation	Road Construction			7
1		Middle Basin	Sedimentation	Road Construction			22
1		Lower Basin	Sedimentation	Road Construction			20

S Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
6 R6.blackwood.sed Cr		Blackwood Creek (Placer County)	Bedded Sediment	Various	9 2007	11	17272 total

T Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
6 R6.SquawCk.sed R		Squaw Creek (Placer County)	Sedimentation /controllable sources	Various – basin plan amendment	4 13 2006	8.2	10,900

Adopted TMDLs for Construction Sediment Sources

Region	Type	Name	Pollutant Stressor	Potential Sources	**TMDL Completion Date**	**Watershed Area** mi^2	Waste load Allocation tons mi^2 yr
8 R		Newport Bay San Diego Creek Watershed	Sedimentation	Construction Land Development	1999 2.24	(1432 acres)	125,000 tons per Year (no more than 13,000 tons per year from construction sites)

Appendix 4 Non Sediment TMDLs

Region 1 Lost River-DIN and CBOD

Region 1 Source: Cal Trans Construction TMDL Completion Date: 12 30 2008 TMDL Type: River, Lake Watershed Area= 2996 mi^2	Pollutant Stressors/WLA	
	Dissolved inorganic nitrogen (DIN) (metric tons/yr)	**Carbonaceous biochemical oxygen demand (CBOD) (metric tons/yr)**
Lost River from the Oregon border to Tule Lake	.1 .2	
Tule Lake Refuge	.1	.2
Lower Klamath Refuge	.1	.2

Region 2 San Francisco Bay-Mercury

Region 2 Source:Non-Urban Stormwater Runoff TMDL Type: Bay	**Name**	**Pollutant Stressor/WLA**	**TMDL Completion Date**
	San Francisco Bay	Mercury 25 kg/year	08 09 2006

Region 4 Machado Lake Nutrients - Resolution No. 2008-006
(Effective Date - March 11, 2009)

General Construction Stormwater Permit WLAs	Years After Effective Date	Total Phosphorus (mg/L)	Total Nitrogen (TKN + NO3-N + NO2-N) (mg/L)
Interim WLAs[1]	At Effective Date	1.25	3.50
Interim WLAs[2] 5	years	1.25	2.45
Final WLAs[2]	9.5 years	0.10	1.00

[1] The compliance points for effective date interim WLAs are measured in the lake.
[2] No compliance points are specified for general construction stormwater permits for the year 5 interim WLAs and final WLAs

Region 4 Ballona Creek-Metals and Selenium – Resolution No. 2007-015
(Effective Date October 29, 2008)

Wet Weather WLAs

Region 4 Source: NPDES General Construction TMDL Completion Date: 10 29 2008 TMDL Type: Creek	Copper (Cu)		Lead (Pb)		Selenium (Se)		Zinc (Zn)	
	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre
Ballona Creek	4.94E-07 x Daily storm volume (L)	2.20E-10 x Daily storm volume (L)	1.62E-06 x Daily storm volume (L)	7.20E-10 x Daily storm volume (L)	1.37E-07 x Daily storm volume (L)	6.10E-11 x Daily storm volume (L)	3.27E-06 x Daily storm volume (L)	1.45E-09 x Daily storm volume (L)

Wet-weather WLA Implementation

- Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Dry-weather WLAs

A waste load allocation of zero is assigned to all general construction storm water permits during dry weather.

Dry-weather WLA Implementation

Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:

(1) infeasible to eliminate
(2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
(3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.
Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.

Region 4 Los Angeles River and Tributaries-Metals– Resolution No. 2007-014
(Effective Date October 29, 2008)

Wet Weather WLAs

	Cadmium (Cd)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
	kg/day	g/day/acre	kg/day	g/day/acre	kg/day	g/day/acre	kg/day	g/day/acre
5.9x10	$^{-11}$ x Daily storm volume (L)	7.6×10^{-12} x Daily storm volume (L)	3.2×10^{-10} x Daily storm volume (L)	4.2×10^{-11} x Daily storm volume (L)	1.2×10^{-9} x Daily storm volume (L)	1.5×10^{-10} x Daily storm volume (L)	3.01×10^{-9} x Daily storm volume (L)	3.9×10^{-10} x Daily storm volume (L)

Wet-weather WLA Implementation

- Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Dry-weather WLAs

A waste load allocation of zero is assigned to all general construction storm water permits during dry weather.

Dry-weather WLA Implementation

Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:

(1) infeasible to eliminate
(2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
(3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.
Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.

Region 4 Calleguas Creek Metals TMDL – Resolution No. 2006-012 (Effective Date - March 26, 2007)

Interim Limits and Final WLAs for Total Recoverable Copper, Nickel, and Selenium
Interim limits and waste load allocations are applied to receiving water.

A. Interim Limits

Constituents	Calleguas and Conejo Creek			Revolon Slough		
	Dry CMC (ug/L)	Dry CCC (ug/L)	Wet CMC (ug/L)	Dry CMC (ug/L)	Dry CCC (ug/L)	Wet CMC (ug/L)
Copper*	23	19	204	23	19	204
Nickel	15	13	(a)	15	13	(a)
Selenium	(b)	(b)	(b)	14	13	(a)

(a) The current loads do not exceed the TMDL under wet conditions; interim limits are not required.
(b) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.
(c) Attainment of interim limits will be evaluated in consideration of background loading data, if available.

B. Final WLAs for Total Recoverable Copper, Nickel, and Selenium

Dry-Weather WLAs in Water Column

Flow Range	Calleguas and Conejo Creek			Revolon Slough		
	Low Flow	Average Flow	Elevated Flow	Low Flow	Average Flow	Elevated Flow
Copper1 (lbs/day)	0.04*WER - 0.02	0.12*WER - 0.02	0.18*WER - 0.03	0.03*WER - 0.01	0.06*WER - 0.03	0.13*WER - 0.02
Nickel (lbs/day)	0.100	0.120	0.440	0.050	0.069	0.116
Selenium (lbs/day)	(a)	(a)	(a)	0.004	0.003	0.004

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Wet-Weather WLAs in Water Column

Constituent	Calleguas Creek	Revolon Slough
Copper[1] (lbs/day)	(0.00054*Q^2*0.032*Q - 0.17)*WER - 0.06	(0.0002*Q2+0.0005*Q)*WER
Nickel[2] (lbs/day)	0.014*Q^2+0.82*Q	0.027*Q^2+0.47*Q
Selenium[2] (lbs/day)	(a)	0.027*Q^2+0.47*Q

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.

[2] Current loads do not exceed loading capacity during wet weather. Sum of all loads cannot exceed loads presented in the table

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Q: Daily storm volume.

Interim Limits and Final WLAs for Mercury in Suspended Sediment

Flow Range	Calleguas Creek		Revolon Slough	
	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)
0-15,000 MGY	3.3	0.4	1.7	0.1
15,000-25,000 MGY	10.5	1.6	4	0.7
Above 25,000 MGY	64.6	9.3	10.2	1.8

MGY: million gallons per year.

In accordance with current practice, a group concentration-based WLA has been developed for all permitted stormwater discharges, including municipal separate storm sewer systems (MS4s), Caltrans, general industrial and construction stormwater permits, and Naval Air Weapons Station Point Mugu. Dischargers will have a required 25%, 50% and 100% reduction in the difference between the current loadings and the load allocations at 5, 10 and 15 years after the effective date, respectively. Achievement of required reductions will be evaluated based on progress towards BMP implementation as outlined in the urban water quality management plans (UWQMPs). If the interim reductions are not met, the dischargers will submit a report to the Executive Officer detailing why the reductions were not met and the steps that will be taken to meet the required reductions.

Region 4 Calleguas Creek-OC Pesticides, PCBs, and Siltation (Resolution 2005-010)
Effective Date - March 24, 2006

Interim Requirements

Region 4 Calleguas Creek Source: Minor NPDES point sources/WDRs TMDL Completion Date: 3 24 2006 TMDL Type:Creek	**Pollutant Stressor**	**WLA Daily Max (µg/L)**	**WLA Monthly Ave (µg/L)**
	Chlordane 1.2		0.59
	4,4-DDD 1.7		0.84
	4,4-DDE 1.2		0.59
	4,4-DDT 1.2		0.59
	Dieldrin 0.28		0.14
	PCB’s 0.34		0.17
	Toxaphene 0.33		0.16

Region 4 Calleguas Creek-Calleguas Creek Toxicity (Resolution 2005-009)
Effective Date - March 24, 2006

Minor sources include NPDES permittees other than POTWs and MS4s, discharging to the Calleguas Creek Watershed. A wasteload of 1.0 TUc is allocated to the minor point sources discharging to the Calleguas Creek Watershed. Additionally, the following wasteloads for chlorpyrifos and diazinon are established. Final WLAs apply as of March 24, 2006.

Chlorpyrifos WLAs, ug/L
Final WLA
(4 day)
0.014
Diazinon WLAs, ug/L
Final WLA
Acute and Chronic
0.10

Region 4 Calleguas Creek-Salts (Resolution 2007-016)
Effective Date – December 2, 2008

Final Dry Weather Pollutant WLA (mg/L)					
Region 4 Calleaguas Creek Source Permitted Stormwater Dischargers TMDL Completion Date: 12 2 2008 TMDL Type:Creek	**Critical Condition Flow Rate (mgd)**	**Chloride (lb/day)**	**TDS (lb/day)**	**Sulfate (lb/day)**	**Boron (lb/day)**
Simi	1.39	1738 9849 2897 12			
Las Posas	0.13	157 887 261 N/A			
Conejo	1.26	1576 8931 2627 N/A			
Camarillo	0.06	72	406 119 N/A		
Pleasant Valley (Calleguas)	0.12	150 850 250 N/A			
Pleasant Valley (Revolon)	0.25	314	1778	523	2

Dry Weather Interim Pollutant WLA (mg/L)				
	Chloride (mg/L)	**TDS (mg/L)**	**Sulfate (mg/L)**	**Boron (mg/L)**

Simi 230.0		1720.0	1289.0	1.3
Las Posas	230	1720	1289	1.3
Conejo 230		1720	1289	1.3
Camarillo 230		1720	1289	1.3
Pleasant Valley (Calleguas)	230	1720	1289	1.3
Pleasant Valley (Revolon)	230	1720	1289	1.3

- Dry- weather waste load allocations apply in the receiving water at the base of each subwatershed. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.
- Because wet weather flows transport a large mass of salts at low concentrations, these dischargers meet water quality objectives during wet weather. No wet weather allocations are assigned.

Ballona Creek Toxic Pollutants (Resolution No. 2005-008)
Effective Date - January 11, 2006

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)

Cadmium	Copper	Lead	Silver	Zinc
0.1	3 4 0.1			13

Organics per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)

Chlordane	DDTs	Total PCBs	Total PAHs
0.04	0.14	2	350

Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed spec ific general construction storm water permit developed by the Regional Board.

Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs.

All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations.

Region 4 Marina Del Rey Harbor Toxic Pollutants TMDL (Resolution No. 2005-012)
Effective Date March 22, 2006

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)

Copper	Lead	Zinc
2.3	3.1	10

Organics per acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)

Chlordane	Total PCBs
0.03	1.5

Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed spec ific general construction storm water permit developed by the Regional Board.

Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs.

All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations.

Region 4 San Gabriel River and Tributaries-Metals and Selenium (EPA-established TMDL – Effective date: 3/26/07)

Wet-weather allocations

Waterbody	Copper	Lead	Zinc
San Gabriel River Reach 2*		0.8 kg/d	
Coyote Creek**	0.513 kg/d	2.07 kg/d	3.0 kg/d

*Mass-based allocations are based on a flow of 260 cfs (daily storm volume = 6.4 x10^8 liters)

**Mass-based allocations are based on a flow of 156 cfs (daily storm volume = 3.8 x10^8 liters)

Dry-weather allocations

The dry-weather copper waste load allocation for general construction storm water permittees that discharge to San Gabriel Reach 1, Coyote Creek, and the Estuary is zero.

The dry-weather selenium allocation for general construction storm water permittees that discharge to San Jose Creek Reach 1 and Reach 2 is 5 µg/L (total recoverable metals).

Region 4 Upper Santa Clara River Chloride TMDL Adopted by Resolution No 2006-016 Effective Date June 12, 2008

“Other NPDES dischargers” have a chloride WLA equal to 100 mg/L.

This TMDL was revised by Resolution No 2008-012, which, when it becomes effective, includes the following conditional WLAs for “Other minor NPDES discharges”:

Reach	Concentration-based Conditional WLA for Chloride (mg/L)*
6	150 (12-month Average), 230 (Daily Maximum)
5	150 (12-month Average), 230 (Daily Maximum)
4B	117 (3-month Average), 230 (Daily Maximum)

*The conditional WLAs for chloride for all point sources shall apply only when chloride load reductions and/or chloride export projects are in operation by the Santa Clarita Valley Sanitation District according to the implementation plan for the TMDL. If these conditions are not met, WLAs shall be based on existing water quality objectives for chloride of 100 mg/L.

Region 4 The Harbor Beaches of Ventura County-Bacteria (Adopted by Resolution No. 2007-017) Effective Date – December 18, 2008

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the Channel Islands Harbor subwatershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean limits.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Los Angeles Harbor Bacteria TMDL (Adopted by Resolution No. 2004-001)
Effective Date – March 10, 2005

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the watershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Ballona Creek Bacteria TMDL (Adopted by Resolution No. 2006-011)
Effective Date – April 27, 2007

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the watershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Region 4 Resolution No. 03-009 Los Angeles River and Tributaries-Nutrients

Minor Point Sources

Waste loads are allocated to minor point sources enrolled under NPDES or WDR permits including but not limited to Tapia WRP, Whittier Narrows WRP, Los Angeles Zoo WRP, industrial and construction stormwater, and municipal storm water and urban runoff from municipal separate storm sewer systems (MS4s)

Region 4 Minor Point Sources for NPDES/WDR Permits TMDL Effective Date: 3 23 2004 TMDL Type: River	Pollutant Stressor/WLA				
	Total Ammonia (NH_3)		**Nitrate-nitrogen (NO_3-N)**	**Nitrite-nitrogen (NO_2-N)**	**NO_3-N + NO_3-N**
	1 Hr Ave mg/l	30 Day Ave mg/l	30 Day Ave mg/l		30 Day Ave mg/l
LA River Above Los Angeles-Glendale WRP (LAG)	4.7 1.6 8.0			1.0	8.0
LA River Below LAG	8.7	2.4	8.0	1.0	8.0
Los Angeles Tributaries 10.1		2.3	8.0	1.0	8.0

Malibu Creek Attachment A to Resolution No. 2004-019R-Bacteria

Effective date: 1 24 2006. The WLAs for permittees under the NPDES General Stormwater Construction Permit are zero (0) days of allowable exceedances for the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Region 4 Marina del Rey Harbor, Mothers' Beach and Back Basins
Attachment A to Resolution No. 2003-012-Bacteria

Effective date: 3 18 2004. Discharges from general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the MdR Watershed will also be subject to a WLA of zero days of allowable exceedances.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Santa Clara River Nutrients TMDL (Adopted by Resolution No. 2003-011
Effective Date - March 23, 2004

Concentration-based wasteloads are allocated to municipal, industrial and construction stormwater sources regulated under NPDES permits. For stormwater permittees discharging into Reach 7, the thirty-day WLA for ammonia as nitrogen is 1.75 mg/L and the one-hour WLA for ammonia as nitrogen is 5.2 mg/L; the thirty-day average WLA for nitrate plus nitrite as nitrogen is 6.8 mg/L. For stormwater permittees discharging into Reach 3, the thirty-day WLA for ammonia as nitrogen is 2.0 mg/L and the one-hour WLA for ammonia as nitrogen is 4.2 mg/L; the thirty-day average WLA for nitrate plus nitrite nitrogen is 8.1 mg/L.

Region 8 RESOLUTION NO. R8-2007- 0024

Total Maximum Daily Loads (TMDLs) for San Diego Creek,
Upper and Lower Newport Bay, Orange County, California

Region 8 NPDES Construction Permit TMDL Completion Date: 1 24 1995	Organochlorine Compounds							
	Total DDT		**Chlordane**		**Total PCBs**		**Toxaphene**	
TMDL Type: River. Cr, Bay	g/day	g/yr	g/day	g/yr	g/day	g/yr	g/day	g/yr
San Diego Creek	.27	99.8	**.18***	**64.3***	**.09***	**31.5***	.004 1.5	
Upper Newport Bay	.11	40.3 .06		23.4 .06		23.2	**X**	**X**
Lower Newport Bay	.04	14.9	.02 8.6 .17	60.7			**X**	**X**

*Red= Informational WLA only, not for enforcement purposes

Organochlorine Compounds TMDLs Implementation Tasks and Schedule

Regional Board staff shall develop a SWPPP Improvement Program that identifies the Regional Board’s expectations with respect to the content of SWPPPs, including documentation regarding the selection and implementation of BMPs, and a sampling and analysis plan. The Improvement Program shall include specific guidance regarding the development and implementation of monitoring plans, including the constituents to be monitored, sampling frequency and analytical protocols. The SWPPP Improvement Program shall be completed by (*the date of OAL approval of this BPA*). ***No later than two months*** from completion of the Improvement Program, Board staff shall assure that the requirements of the Program are communicated to interested parties, including dischargers with existing authorizations under the General Construction Permit. Existing, authorized dischargers shall revise their project SWPPPs as needed to address the Program requirements as soon as possible but ***no later than (three months of completion of the SWPPP Improvement Program)***. Applicable SWPPPs that do not adequately address the Program requirements shall be considered inadequate and enforcement by the Regional Board shall proceed accordingly. The Caltrans and Orange County MS4 permits shall be revised as needed to assure that the permittees communicate the Regional Board’s SWPPP expectations, based on the SWPPP Improvement Program, with the Standard Conditions of Approval.

APPENDIX 5: Glossary

Active Areas of Construction
All areas subject to land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas. All previously active areas are still considered active areas until final stabilization is complete. [The construction activity Phases used in this General Permit are the Preliminary Phase, Grading and Land Development Phase, Streets and Utilities Phase, and the Vertical Construction Phase.]

Active Treatment System (ATS)
A treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the reduction of turbidity caused by fine suspended sediment.

Acute Toxicity Test
A chemical stimulus severe enough to rapidly induce a negative effect; in aquatic toxicity tests, an effect observed within 96 hours or less is considered acute.

Air Deposition
Airborne particulates from construction activities. .

Approved Signatory
A person who has legal authority to sign, certify, and electronically submit Permit Registration Documents and Notices of Termination on behalf of the Legally Responsible Person.

Beneficial Uses
As defined in the California Water Code, beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Best Available Technology Economically Achievable (BAT)
As defined by USEPA, BAT is a technology-based standard established by the Clean Water Act (CWA) as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

Best Conventional Pollutant Control Technology (BCT)

As defined by USEPA, BCT is a technology-based standard for the discharge from existing industrial point sources of conventional pollutants including biochemical oxygen demand (BOD), total suspended sediment (TSS), fecal coliform, pH, oil and grease.

Best Professional Judgment (BPJ)
The method used by permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data.

Best Management Practices (BMPs)
BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Chain of Custody (COC)
Form used to track sample handling as samples progress from sample collection to the analytical laboratory. The COC is then used to track the resulting analytical data from the laboratory to the client. COC forms can be obtained from an analytical laboratory upon request.

Coagulation
The clumping of particles in a discharge to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.

Common Plan of Development
Generally a contiguous area where multiple, distinct construction activities may be taking place at different times under one plan. A plan is generally defined as any piece of documentation or physical demarcation that indicates that construction activities may occur on a common plot. Such documentation could consist of a tract map, parcel map, demolition plans, grading plans or contract documents. Any of these documents could delineate the boundaries of a common plan area. However, broad planning documents, such as land use master plans, conceptual master plans, or broad-based CEQA or NEPA documents that identify potential projects for an agency or facility are not considered common plans of development.

Daily Average Discharge
The discharge of a pollutant measured during any 24-hour period that reasonably represents a calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged during the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration) the daily discharge is calculated as the average measurement of the pollutant

throughout the day (40 CFR 122.2). In the case of pH, the pH must first be converted from a log scale.

Debris
Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

Direct Discharge
A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff.

Discharger
The Legally Responsible Person (see definition) or entity subject to this General Permit.

Dose Rate (for ATS)
In exposure assessment, dose (e.g. of a chemical) per time unit (e.g. mg/day), sometimes also called dosage.

Drainage Area
The area of land that drains water, sediment, pollutants, and dissolved materials to a common outlet.

Effluent
Any discharge of water by a discharger either to the receiving water or beyond the property boundary controlled by the discharger.

Effluent Limitation
Any numeric or narrative restriction imposed on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into waters of the United States, the waters of the contiguous zone, or the ocean.

Erosion
The process, by which soil particles are detached and transported by the actions of wind, water, or gravity.

Erosion Control BMPs
Vegetation, such as grasses and wildflowers, and other materials, such as straw, fiber, stabilizing emulsion, protective blankets, etc., placed to stabilize areas of disturbed soils, reduce loss of soil due to the action of water or wind, and prevent water pollution.

Field Measurements
Testing procedures performed in the field with portable field-testing kits or meters.

Final Stabilization
All soil disturbing activities at each individual parcel within the site have been completed in a manner consistent with the requirements in this General Permit.

First Order Stream
Stream with no tributaries.

Flocculants
Substances that interact with suspended particles and bind them together to form flocs.

Good Housekeeping BMPs
BMPs designed to reduce or eliminate the addition of pollutants to construction site runoff through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Grading Phase (part of the Grading and Land Development Phase)
Includes reconfiguring the topography and slope including; alluvium removals; canyon cleanouts; rock undercuts; keyway excavations; land form grading; and stockpiling of select material for capping operations.

Hydromodification
Hydromodification is the alteration of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources. Hydromodification can cause excessive erosion and/or sedimentation rates, causing excessive turbidity, channel aggradation and/or degradation.

Identified Organisms
Organisms within a sub-sample that is specifically identified and counted.

Inactive Areas of Construction
Areas of construction activity that are not active and those that have been active and are not scheduled to be re-disturbed for at least 14 days.

Index Period
The period of time during which bioassessment samples must be collected to produce results suitable for assessing the biological integrity of streams and rivers. Instream communities naturally vary over the course of a year,and sampling during the index period ensures that samples are collected during a time frame when communities are stable so that year-to-year consistency is obtained. The index period approach provides a cost-effective alternative to year-round sampling. Furthermore, sampling within the appropriate index period will yield results that are comparable to the assessment thresholds or criteria for a given region, which are established for the same index period. Because index

periods differ for different parts of the state, it is essential to know the index period for your area.

K Factor
The soil erodibility factor used in the Revised Universal Soil Loss Equation (RUSLE). It represents the combination of detachability of the soil, runoff potential of the soil, and the transportability of the sediment eroded from the soil.

Legally Responsible Person
The person who possesses the title of the land or the leasehold interest of a mineral estate upon which the construction activities will occur for the regulated site. For linear underground/overhead projects, it is in the person in charge of the utility company, municipality, or other public or private company or agency that owns or operates the LUP.

Likely Precipitation Event
Any weather pattern that is forecasted to have a 50% or greater chance of producing precipitation in the project area. The discharger shall obtain likely precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

Maximum Allowable Threshold Concentration (MATC)
The allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:

The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Natural Channel Evolution
The physical trend in channel adjustments following a disturbance that causes the river to have more energy and degrade or aggrade more sediment. Channels have been observed to pass through 5 to 9 evolution types. Once they pass though the suite of evolution stages, they will rest in a new state of equilibrium.

Non-Storm Water Discharges
Discharges are discharges that do not originate from precipitation events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

Non-Visible Pollutants

Pollutants associated with a specific site or activity that can have a negative impact on water quality, but cannot be seen though observation (ex: chlorine). Such pollutants being discharged are not authorized.

Numeric Action Level (NAL)
Level is used as a warning to evaluate if best management practices are effective and take necessary corrective actions. Not an effluent limit.

Original Sample Material
The material (i.e., macroinvertebrates, organic material, gravel, etc.) remaining after the subsample has been removed for identification.

pH
Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Post-Construction BMPs
Structural and non-structural controls which detain, retain, or filter the release of pollutants to receiving waters after final stabilization is attained.

Preliminary Phase (Pre-Construction Phase - Part of the Grading and Land Development Phase)
Construction stage including rough grading and/or disking, clearing and grubbing operations, or any soil disturbance prior to mass grading.

Project

Qualified SWPPP Developer
Individual who is authorized to develop and revise SWPPPs.

Qualified SWPPP Practitioner
Individual assigned responsibility for non-storm water and storm water visual observations, sampling and analysis, and responsibility to ensure full compliance with the permit and implementation of all elements of the SWPPP, including the preparation of the annual compliance evaluation and the elimination of all unauthorized discharges.

Qualifying Rain Event
Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events.

R Factor
Erosivity factor used in the Revised Universal Soil Loss Equation (RUSLE). The R factor represents the erosivity of the climate at a particular location. An

average annual value of R is determined from historical weather records using erosivity values determined for individual storms. The erosivity of an individual storm is computed as the product of the storm's total energy, which is closely related to storm amount, and the storm's maximum 30-minute intensity.

Rain Event Action Plan (REAP)
Written document, specific for each rain event, that when implemented is designed to protect all exposed portions of the site within 48 hours of any likely precipitation event.

Remaining Sub sampled Material
The material (e.g., organic material, gravel, etc.) that remains after the organisms to be identified have been removed from the subsample for identification. (Generally, no macroinvertebrates are present in the remaining subsampled material, but the sample needs to be checked and verified using a complete Quality Assurance (QA) plan)

Routine Maintenance
Activities intended to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Runoff Control BMPs
Measures used to divert runon from offsite and runoff within the site.

Run-on
Discharges that originate offsite and flow onto the property of a separate project site.

Revised Universal Soil Loss Equation (RUSLE)
Empirical model that calculates average annual soil loss as a function of rainfall and runoff erosivity, soil erodibility, topography, erosion controls, and sediment controls.

Sampling and Analysis Plan
Document that describes how the samples will be collected, under what conditions, where and when the samples will be collected, what the sample will be tested for, what test methods and detection limits will be used, and what methods/procedures will be maintained to ensure the integrity of the sample during collection, storage, shipping and testing (i.e., quality assurance/quality control protocols).

Sediment
Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation
Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sediment Control BMPs
Practices that trap soil particles after they have been eroded by rain, flowing water, or wind. They include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped (e.g., silt fence, sediment basin, fiber rolls, etc.).

Settleable Solids (SS)
Solid material that can be settled within a water column during a specified time frame. It is typically tested by placing a water sample into an Imhoff settling cone and then allowing the solids to settle by gravity for a given length of time. Results are reported either as a volume (mL/L) or a mass (mg/L) concentration.

Sheet Flow
Flow of water that occurs overland in areas where there are no defined channels where the water spreads out over a large area at a uniform depth.

Site

Soil Amendment
Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water.

Streets and Utilities Phase
Construction stage including excavation and street paving, lot grading, curbs, gutters and sidewalks, public utilities, public water facilities including fire hydrants, public sanitary sewer systems, storm sewer system and/or other drainage improvements.

Structural Controls
Any structural facility designed and constructed to mitigate the adverse impacts of storm water and urban runoff pollution

Suspended Sediment Concentration (SSC)
The measure of the concentration of suspended solid material in a water sample by measuring the dry weight of all of the solid material from a known volume of a collected water sample. Results are reported in mg/L.

Total Suspended Solids (TSS)
The measure of the suspended solids in a water sample includes inorganic substances, such as soil particles and organic substances, such as algae,

aquatic plant/animal waste, particles related to industrial/sewage waste, etc. The TSS test measures the concentration of suspended solids in water by measuring the dry weight of a solid material contained in a known volume of a sub-sample of a collected water sample. Results are reported in mg/L.

Toxicity
The adverse response(s) of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

Turbidity
The cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The turbidity test is reported in Nephelometric Turbidity Units (NTU) or Jackson Turbidity Units (JTU).

Vertical Construction Phase
The Build out of structures from foundations to roofing, including rough landscaping.

Waters of the United States
Generally refers to surface waters, as defined by the federal Environmental Protection Agency in 40 C.F.R. § 122.2.[1]

Water Quality Objectives (WQO)
Water quality objectives are defined in the California Water Code as limits or levels of water quality constituents or characteristics, which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

[1] The application of the definition of "waters of the United States" may be difficult to determine; there are currently several judicial decisions that create some confusion. If a landowner is unsure whether the discharge must be covered by this General Permit, the landowner may wish to seek legal advice.

APPENDIX 6:
Acronym List

ASBS	Areas of Special Biological Significance
ASTM	American Society of Testing and Materials; Standard Test Method for Particle-Size Analysis of Soils
ATS	Active Treatment System
BASMAA	Bay Area Storm water Management Agencies Association
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
CAFO	Confined Animal Feeding Operation
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities
CIWQS	California Integrated Water Quality System
CKD	Cement Kiln Dust
COC	Chain of Custody
CPESC	Certified Professional in Erosion and Sediment Control
CPSWQ	Certified Professional in Storm Water Quality
CSMP	Construction Site Monitoring Program
CTB	Cement Treated Base
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
CWP	Center for Watershed Protection
DADMAC	Diallyldimethyl-ammonium chloride
DDNR	Delaware Department of Natural Resources
DFG	Department of Fish and Game
DHS	Department of Health Services
DWQ	Division of Water Quality
EC	Electrical Conductivity
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
HSPF	Hydrologic Simulation Program Fortran
JTU	Jackson Turbidity Units
LID	Low Impact Development
LOEC	Lowest Observed Effect Concentration
LRP	Legally Responsible Person
LUP	Linear Underground/Overhead Projects

MATC	Maximum Allowable Threshold Concentration
MDL	Method Detection Limits
MRR	Monitoring and Reporting Requirements
MS4	Municipal Separate Storm Sewer System
MUSLE	Modified Universal Soil Loss Equation
NAL	Numeric Action Level
NEL	Numeric Effluent Limitation
NICET	National Institute for Certification in Engineering Technologies
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
PAC	Polyaluminum chloride
PAM	Polyacrylamide
PASS	Polyaluminum chloride Silica/sulfate
POC	Pollutants of Concern
PoP	Probability of Precipitation
POTW	Publicly Owned Treatment Works
PRDs	Permit Registration Documents
PWS	Planning Watershed
QAMP	Quality Assurance Management Plan
QA/QC	Quality Assurance/Quality Control
REAP	Rain Event Action Plan
Regional Board	Regional Water Quality Control Board
ROWD	Report of Waste Discharge
RUSLE	Revised Universal Soil Loss Equation
RW	Receiving Water
SMARTS	Storm water Multi Application Reporting and Tracking System
SS	Settleable Solids
SSC	Suspended Sediment Concentration
SUSMP	Standard Urban Storm Water Mitigation Plan
SW	Storm Water
SWARM	Storm Water Annual Report Module
SWAMP	Surface Water Ambient Monitoring Program
SWMM	Storm Water Management Model
SWMP	Storm Water Management Program
SWPPP	Storm Water Pollution Prevention Plan
TC	Treatment Control
TDS	Total Dissolved Solids

TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACOE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDID	Waste Discharge Identification Number
WDR	Waste Discharge Requirements
WLA	Waste Load Allocation
WET	Whole Effluent Toxicity
WRCC	Western Regional Climate Center
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objective
WQS	Water Quality Standard

APPENDIX 7:
State and Regional Water Resources Control Board Contacts

NORTH COAST REGION (1)
5550 Skylane Blvd, Ste. A
Santa Rosa, CA 95403
(707) 576-2220 FAX: (707)523-0135

SAN FRANCISCO BAY REGION (2)
1515 Clay Street, Ste. 1400
Oakland, CA 94612
(510) 622-2300 FAX: (510) 622-2640

CENTRAL COAST REGION (3)
895 Aerovista Place, Ste 101
San Luis Obispo, CA 93401
(805) 549-3147 FAX: (805) 543-0397

LOS ANGELES REGION (4)
320 W. 4th Street, Ste. 200
Los Angeles, CA 90013
(213) 576-6600 FAX: (213) 576-6640

CENTRAL VALLEY REGION (5S)
11020 Sun Center Dr., #200
Rancho Cordova, CA 95670-6114
(916) 464-3291 FAX: (916) 464-4645

FRESNO BRANCH OFFICE (5F)
1685 E St.
Fresno, CA 93706
(559) 445-5116 FAX: (559) 445-5910

REDDING BRANCH OFFICE (5R)
415 Knollcrest Drive, Ste. 100
Redding, CA 96002
(530) 224-4845 FAX: (530) 224-4857

LAHONTAN REGION (6 SLT)
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(530) 542-5400 FAX: (530) 544-2271

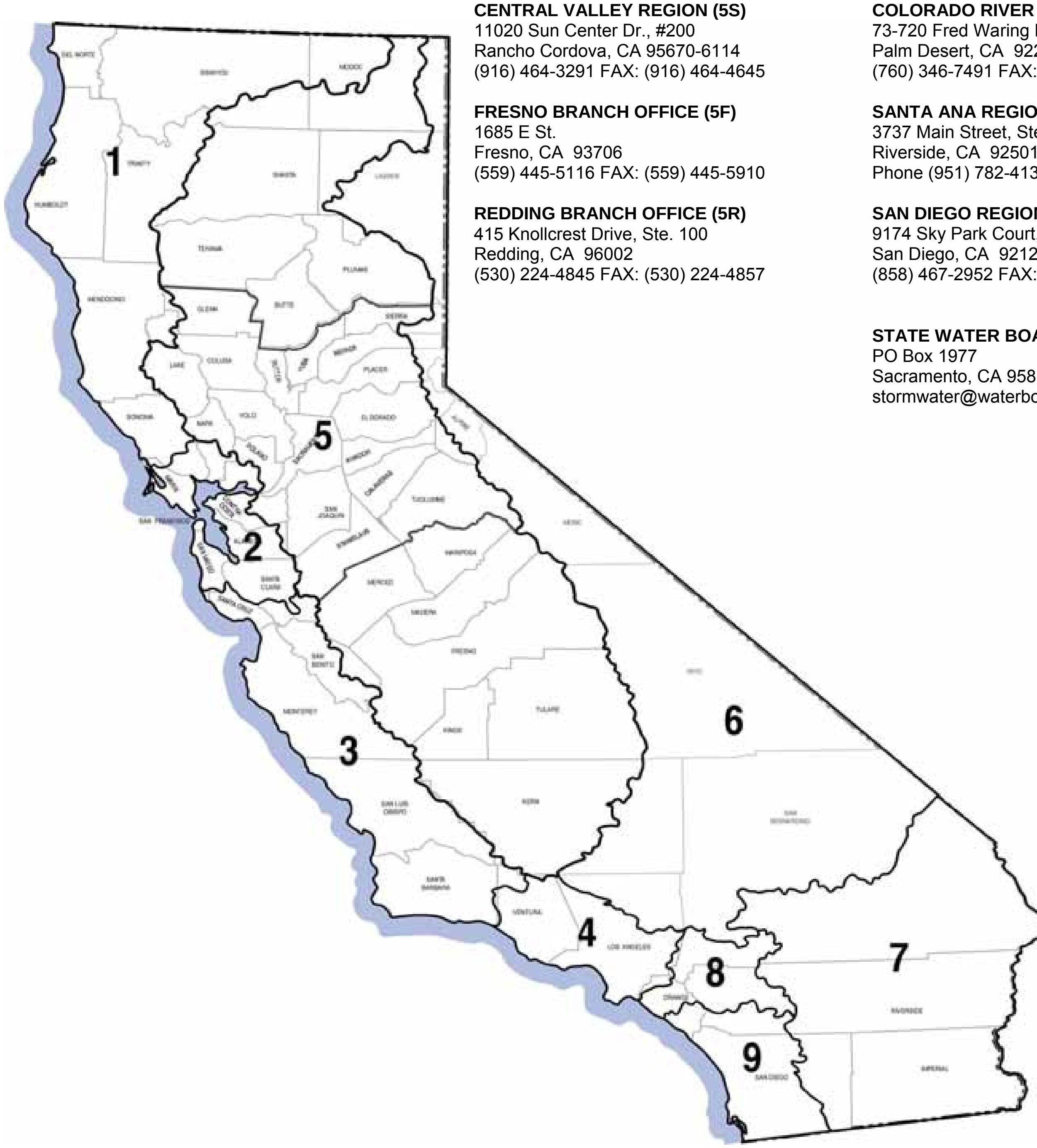
VICTORVILLE OFFICE (6V)
14440 Civic Drive, Ste. 200
Victorville, CA 92392-2383
(760) 241-6583 FAX: (760) 241-7308

COLORADO RIVER BASIN REGION (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491 FAX: (760) 341-6820

SANTA ANA REGION (8)
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
Phone (951) 782-4130 FAX: (951) 781-6288

SAN DIEGO REGION (9)
9174 Sky Park Court, Ste. 100
San Diego, CA 92123-4340
(858) 467-2952 FAX: (858) 571-6972

STATE WATER BOARD
PO Box 1977
Sacramento, CA 95812-1977
stormwater@waterboards.ca.gov



Appendix B
Stormwater Pollution Prevention Plan Outline

Annotated Outline of SWPPP Components to meet General Permit Requirements

This appendix presents a recommended structure for a construction site Stormwater Pollution Prevention Plan (SWPPP) with annotated content. The structure and content is based on a combination of specific General Permit requirements and other suggested content to meet the overall General Permit requirements *to design a SWPPP to control construction site pollutants and their sources (Section XIV.A.1) and that the SWPPP must include information needed to demonstrate compliance with all requirements of the General Permit (Section I.M.77)*. The level of detail and content of a site-specific SWPPP should be tailored to the specific project based on the judgment of the Qualified SWPPP Developer (QSD). *Specific General Permit SWPPP requirements (i.e., items that are specifically required by the General Permit to be included in the site's SWPPP document) are italicized in the below text with reference sections cited (e.g., "Section I.D").*

The suggested SWPPP outline is followed by the outline annotated with suggested content for each section.

B.1 Suggested SWPPP Outline

SWPPP Certification By Qualified SWPPP Developer

SECTION 1 SWPPP Requirements

1.1 Introduction

1.2 Permit Registration Documents

1.3 SWPPP Availability and Implementation

1.4 SWPPP Amendments

1.5 Retention of Records

1.6 Required Non-Compliance Reporting

1.7 Annual Report

1.8 Changes to Permit Coverage

1.9 Notice of Termination

SECTION 2 Project Information

2.1 Project and Site Description

2.2 Stormwater Run-On From Offsite Areas

2.3 Findings of the Construction Site Sediment and Receiving Water Risk Determination

2.4 Construction Schedule

2.5 Potential Construction Site Pollutant Sources

2.6 Identification of Non-Stormwater Discharges

B.2 Annotated SWPPP Outline

SWPPP Certification by Qualified SWPPP Developer (QSD)

Include in SWPPP a certification statement signed by the QSD that identifies the name and telephone number of the QSD, the QSD's qualifying professional registration, and the date of SWPPP preparation as required by the General Permit (Section VII.B).

Note, the Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer (Section I.F45).

SECTION 1 SWPPP Requirements

1.1 Introduction

Identify the project location, owner and developer if applicable. Reference site or vicinity maps for location. State that the SWPPP has been prepared to comply with the California's General Permit for *Storm Water Discharges Associated with Construction and Land Disturbance Activities* (General Permit), include the State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ for the General Permit and include a copy of the General Permit in SWPPP Appendix A (*Section IV.G.1 requires that a copy of the General Permit be kept on site*; including a copy with the SWPPP is recommended). State the major objectives of the SWPPP as identified in the General Permit (Section XIV.A):

"The discharger shall ensure that the SWPPPs for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;
2. Where not otherwise required to be under a Regional Water Quality Control Board (RWQCB) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
3. Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;
4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and
5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed."

Consider stating the following additional SWPPP objectives:

- Identify post-construction BMPs, which are those measures to be installed during construction that are intended to reduce or eliminate pollutants after construction is completed (post-construction BMPs are required for all sites by Section XIII.B). Note that post-construction BMPs should be developed early in the project planning/design process and reports or drawings related to permanent BMP design should be referenced as needed.
- Identify and provide methods to implement BMP inspection, visual monitoring, Rain Event Action Plan (REAP) and Construction Site Monitoring Program (CSMP) requirements to comply with the General Permit.

1.2 Permit Registration Documents

State when the Permit Registration Documents (PRDs) were submitted.

To obtain coverage under the Construction General Permit, project related PRDs must be submitted to the SWRCB via the Stormwater Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP) (General Permit Sections I.D.36, II.B, and Attachment B). Include the project Waste Discharge Identification (WDID) confirmation in SWPPP Appendix B (*General Permit Section II.B.5 requires that documentation of a valid WDID upon demand*; including a copy with the SWPPP is recommended).

Include copies of the filed PRDs in the SWPPP Appendix B. The following PRDs are required for all projects:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Annual Fee; and
5. Signed Certification Statement.

This SWPPP is also required to be filed electronically and has been submitted to the SWRCB as a PRD.

NOTE: Additional PRDs may be required depending on the construction type and location, including:

- Post-construction water balance calculation;
- Active Treatment System (ATS) plan; and
- Discharges proposing an alternate (site specific) risk justification must submit a soil particle size analysis in accordance with General Permit requirements.

1.3 SWPPP Availability and Implementation

Include a statement regarding the SWPPP availability and implementation.

The General Permit (Section XIV.C) requires the SWPPP be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP Amendments

The General Permit requires that SWPPP be amended or revised by a QSD (Section XIV.A) and that the SWPPP include a listing of the date of initial preparation and the date of each amendment. Amendments must be signed by a QSD (Section VII.B.6). It is recommended that all amendments be dated, directly attached to the SWPPP, and logged in SWPPP Appendix C).

1.5 Retention of Records

Include a statement regarding the records retention and availability.

The General Permit *(Sections I.J.69 and IV.G)* requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. The discharger shall furnish the RWQCB, SWRCB, or US Environmental Protection Agency (EPA), within a reasonable time, any requested information to determine compliance with this General Permit. State in the SWPPP where documents will be kept and how this requirement will be met. RWQCB's may require records to be retained for longer periods.

1.6 Required Non-Compliance Reporting

Include a statement or language regarding required non-compliance reporting.

The General Permit identifies several areas of non-compliance reporting. It is the responsibility of the permittee to properly document reportable discharges or other violations of the General Permit. Exceedances and violations should be reporting using the SMARTS system and include the following:

- Numeric Action Level (NAL) exceedances (NAL Exceedance Report upon request of the RWQCB);
- Numeric Effluent Limitation (NEL) Violation Report
- Self-reporting of any other discharge violations or to comply with RWQCB enforcement actions; and
- Discharges which contain a hazardous substance in excess of reportable quantities established in 40 CFR §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

In the event of the exceedance of a NAL, document the subsequent site evaluation in the SWPPP (Section V.C.4). It is recommended that documentation of all reportable exceedances be included in the SWPPP. Include the results of an NAL exceedance site evaluation along with other non-compliance events in SWPPP Appendix D.

1.7 Annual Report

Include a statement or language regarding annual report requirements with the goal of making site personnel aware of required data collection and reporting elements.

The General Permit requires that all permittees prepare, certify, and electronically submit an Annual Report no later than September 1 of each year. Reporting requirements are identified in Section XVI of the General Permit and include (but are not limited to) providing a summary of:

1) Sampling and analysis results including laboratory reports, analytical methods and reporting limits and chain of custody forms (Risk Levels 2 and 3);
2) Corrective actions and compliance activities, including those not implemented;
3) Violations of the General Permit;
4) Date, time, place, and name(s) of the inspector(s) for all sampling, inspections, and field measurement activities;
5) Visual observation and sample collection exception records; and
6) Training documentation of all personnel responsible for General Permit compliance activities.

1.8 Changes to Permit Coverage

Include a statement acknowledging requirements related to changes in permit coverage.

The General Permit (Section II.C) allows a permittee to reduce or increase the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is sold to a different entity; or when new acreage is added to the project.

To change the acreage covered, the permittee must electronically file modifications to PRDs (revised NOI, site map, SWPPP revisions as appropriate, and certification that new landowners have been notified of applicable requirements to obtain permit coverage (including name, address, phone number, and e-mail address of new landowner) in accordance with requirements of the General Permit within 30 days of a reduction or increase in total disturbed area. Include any updates to PRDs submitted via SMARTS in SWPPP Appendix E. *Document any related SWPPP revisions/amendments (Section II.C.2)* in SWPPP Appendix C.

1.9 Notice of Termination

Include language that identifies the requirements to terminate coverage under the General Permit.

To terminate coverage under the General Permit, a Notice of Termination (NOT) must be submitted electronically via SMARTS. A "final site map" and photos are required to be submitted with the NOT. Filing a NOT certifies that all General Permit requirements have been met. The NOT is submitted when the construction project is complete and within 90 days of meeting all General Permit requirements for termination and final stabilization (Section II.D) including:

- The site will not pose any additional sediment discharge risk than it did prior to construction activity.
- All construction related equipment, materials and any temporary BMPs no longer needed are removed from the site.
- Post-construction stormwater management measures are installed and a long-term maintenance plan that is designed for a minimum of five years has been developed.

The NOT must demonstrate through photos, Revised Universal Soil Loss Equation (RUSLE) results, or results of testing and analysis that the project meets all of the requirements of Section II.D.1 of the General Permit by one of the following methods:

- 70% final cover method (no computational proof required); or
- RUSLE/RUSLE2 method (computational proof required); or
- Custom method (discharger demonstrates that site complies with final stabilization).

SECTION 2 Project Information

2.1 Project and Site Description

Include project and site description information. General guidelines are provided below.

The SWPPP should include a description of the project site and construction activities, existing site conditions and relevant prior land use. The level of detail and amount of information provided in this section should be tailored to the size and complexity of the project. The site description should include the project location, total disturbed area and references to applicable SWPPP drawings or construction plans that fulfill the General Permit site map requirements (General Permit Attachment B.J.2).

In addition, information regarding existing site conditions and prior land use should include site topography and general drainage patterns, project elevation, receiving water information (including receiving water quality and any applicable designations – Total Maximum Daily Loads (TMDLs), 303(d) listings, or other designations as an environmentally sensitive area [ESA]). For multiple watershed projects, receiving water and drainage information should be described separately for each watershed.

The site description should also include general information on soils and geologic conditions, including the approximate thickness of each material if known and reference applicable soils reports as well as information on the depth to groundwater. If groundwater is anticipated to be encountered during construction and dewatering required, describe/list applicable local or RWQCB permits for dewatering. Describe general rainfall patterns and the anticipated rainy season for the project area.

Note that dischargers located in a drainage area where a TMDL has been adopted or approved by the RWQCB or EPA may be required by a separate RWQCB action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual RWQCB permit specific to the area.

2.2 Stormwater Run-On From Offsite Areas

The General Permit requires (Section XIV.A.4) that the SWPPP address calculations and design details as well as BMP controls for site run-on. This section of SWPPP should identify and provide estimates of any anticipated locations of project run-on. BMPs to control run-on should be described in the BMP section and shown on the SWPPP site map.

2.3 Findings of the Construction Site Sediment and Receiving Water Risk Determination

The SWPPP should summarize the assumptions and input parameters and findings of the sediment and receiving water risk assessment, including the resulting site risk level from the Site Risk determination (See Section 2.2.2 of this handbook).

The SWPPP should state the option used to determine the sediment risk, either GIS map or the site specific option. The SWPPP should include a table of the RUSLE R-, K-, and LS-factors determined, the overall predicted sediment loss from the project, and state the sediment risk (i.e., high, medium or low). The SWPPP should include key assumptions and methods made in determining the site's RUSLE factors of Rainfall/Runoff (R), Soil Erodibility (K) and Length and Steepness of Slope (LS). For example, assumptions may include the estimated duration of construction (R-factor), soil horizon (K-factor), and estimated slope length and steepness (LS-factor).

The SWPPP should indicate the receiving water risk (low or high) for the site. If the project has a high receiving water risk, the section should indicate the reason.

Include the output of the overall calculated site risk level based on the Risk Determination Worksheet (Appendix 1 of the General Permit) in the SWPPP.

Once a risk determination has been made, include a summary of permit requirements specific to that risk level. Indicate appropriate NAL (250 NTU for turbidity and 6.5-8.5 for pH for Risk Levels 2 and 3) and NEL (500 NTU for turbidity and 6.0-9.0 for pH for Risk Level 3) values. Indicate which attachment of the General Permit the SWPPP has been prepared to comply with, i.e., Risk Level 1 –Attachment C; Risk Level 2 – Attachment D; and Risk Level 3 – Attachment E.

2.4 Construction Schedule

Identify and reference the project construction schedule and include the schedule as Appendix F of the SWPPP. Recommended minimum information includes the anticipated start and end dates of construction and well as phases of significant grading activities and work near drainages or receiving waters.

2.5 Potential Construction Site Pollutant Sources

Identify construction materials that will be used and activities to be performed that have the potential to contribute pollutants other than sediment to stormwater runoff. The General Permit requires (General Permit Attachments C, D, & E - Section B.5) that permittees conduct an assessment and create a list of potential pollutant sources and identify areas of the site where additional BMPs are necessary to reduce or prevent pollutants in discharges. This list can be included in this section or in an Appendix to the SWPPP (e.g., SWPPP Appendix G). These pollutants and potential pathways must be considered when developing BMPs in accordance with General Permit requirements.

2.6 Identification of Non-Stormwater Discharges

Identify non-stormwater discharges that apply to the site. The General Permit requires (Section XIV.A.2"SWPPP Requirements") that dischargers identify all non-stormwater discharges (where not otherwise required to be under a Regional Water Quality permit) and that discharges be eliminated, controlled, or treated.

SECTION 3 Best Management Practices

3.1 Schedule for BMP Implementation

Identify the schedule for deployment of BMPs. BMPs must be implemented, modified, and maintained to reflect the phase of construction and the weather conditions. In order to be effective, some BMPs must be installed before the site is disturbed (e.g., to provide protection during grading operations or to reduce or minimize pollution from historic areas of contamination during construction).

3.2 Erosion and Sediment Control

Identify in this section, a system of erosion and sediment control BMPs to meet the General Permit requirement of providing site BMPs that are effective and result in the reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the BAT/BCT standard (Section XIV.A.3). The General Permit additionally requires that SWPPPs be designed to address stabilization BMPs installed to reduce or eliminate pollutants after construction (Section XIV.A.5). In addition, if the site is planning to use an ATS for enhanced sediment removal must comply with all ATS requirements in the General Permit and the SWPPP should reference the ATS Plan. This document should be considered a companion document to the SWPPP or included as a SWPPP Appendix.

Identify BMPs for erosion control, sediment control, tracking control, and drainage control (and related BMPs) that meet the minimum requirements for each site risk level category in the General Permit and otherwise prevent pollution associated with construction activities.

Identify BMPs in the SWPPP, and reference BMP fact sheets included in the CASQA *Construction Handbook* or other sources as applicable, and *illustrate on the BMP site map (General Permit Attachment B.J.2)* and in BMP detail sheets on the plans. Include copies of fact sheets in SWPPP Appendix H.

See Section 3 of this handbook for a list of erosion control, sediment control, wind erosion control and tracking control BMPs for consideration in a site-specific suite of BMPs.

3.3 Non-Stormwater and Materials Management

Identify in this section, non-stormwater BMPs to effectively reduce pollutants associated with material storage, material use, waste management, and reduce/properly manage "non-stormwater" that is used or generated on site. The General Permit requires (Section XIV.A.2) that SWPPPs be designed to address the following objective: to identify all non-stormwater discharges (where not otherwise required to be under a Regional Water Quality permit) and that discharges be eliminated, controlled, or treated.

Identify non-stormwater BMPs that meet the minimum requirements for each site risk level and otherwise prevent pollution associated with construction activities.

Identify BMPs in the SWPPP, and reference BMP fact sheets included in the CASQA BMP Handbook – Construction, and *illustrate on the BMP site map (General Permit Attachment B.J.2)* and in BMP detail sheets on the plans as needed. Include copies of fact sheets in SWPPP Appendix H.

See Section 4 of the handbook for a list of non-stormwater and material management BMPs related to material use, specific construction activities, non-stormwater management, and waste management.

3.4 Post-Construction Stormwater Management Measures

Briefly summarize in this section any applicable post-construction BMPs that will be included in the project to meet local MS4 permit or General Permit requirements. Reference applicable project documents (e.g., water quality related reports or post-construction plans) required by the local agencies to obtain building or grading permits, etc. If the SWPPP is used as a contracting document/specification for a general contractor or Qualified SWPPP Practitioner (QSP), clearly identify whether or not responsibilities related to post-construction BMPs (construction, inspection, and long-term maintenance) are part of the scope of work.

For all sites, identify site design, source controls, and treatment controls that will be included in the permanent project as well as funding mechanism for long-term BMP maintenance as applicable. The General Permit requires that all discharges implement BMPs to reduce pollutants in stormwater discharges that are reasonably foreseeable after all construction phases have been completed at the site (Section XIII.B).

Section XIII.A of the General Permit requires post-construction runoff reduction. Identify whether or not the project is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan (SWMP). If so, indicate that the project qualifies for a MS4 exemption to the runoff reduction requirements. If not, identify how the project will meet post construction runoff reduction requirements of the General Permit (Section XIII.A). Options include: 1) implementing non-structural measures and runoff reduction credits using the water balance calculator (provided with the General Permit); and 2) structural controls with RWQCB approval.

SECTION 4 BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP Inspection and Maintenance

Include a statement about BMP inspection and maintenance requirements, including the location of blank and completed inspection checklists/forms. Provide a blank inspection form in the SWPPP (in SWPPP Appendix I) that will be used to record results of the inspection and assessment. Completed inspection forms should be included in SWPPP Appendix I or in an accompanying file/binder that is referenced in the SWPPP and readily accessible on site).

The General Permit requires (Attachments C, D, E; Section G.5) that completed inspection checklists be maintained with the on-site SWPPP. In general the information required to be recorded for BMP/facility inspections includes: the date of the inspection, weather information, site information, observations, descriptions of the inspected BMPs and any deficiencies, and the corrective actions that were taken such as BMPs that were fixed or additional BMPs that were implemented, and the inspectors name, title, and signature.

The required frequency of BMP inspections depends on the type of BMP that is implemented. The General Permit (Attachments C, D, E; Section G.2) requires routine weekly inspections and daily inspections during rain events of all BMPs (for all Risk Categories); however, some BMPs (e.g. tracking controls; Attachments D & E, Section E.7) may require daily monitoring. BMPs must be maintained regularly based on permit-required inspections and observations during the course of normal construction activities.

The General Permit requires dischargers to begin implementing corrective actions within 72 hours for deficiencies identified during inspections (Attachments C, D, E; Section G.3). SWPPP amendments should be prepared by the QSD if warranted by the problem encountered and corrective action required.

4.2 Rain Event Action Plans

Include language regarding the requirement and procedure for preparing and implementing REAPs for each qualifying site and storm event. REAP requirements are stated in General Permit Attachments D and E; Section H and are generally summarized below.

REAPs developed by a QSP, are required for all Risk Level 2 and 3 dischargers for each construction phase. The SWPPP can include REAP templates but the QSP will need to customize them for each rain event. Include site-specific REAP templates for each applicable phase of the project in SWPPP Appendix J. Completed REAPs must be maintained on site. It is recommended that they be maintained with the SWPPP or in an accompanying binder/folder that is referenced in the SWPPP.

The QSP must develop the REAP 48-hours in advance of any precipitation event forecast to have a 50% or greater chance of producing precipitation in the project area. The REAP must be on site and be implemented 24 hours in advance of any the predicted precipitation event.

The REAP is designed to protect all exposed portions of project sites and to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants that could be generated during the rain event.

At minimum the REAP must include the following site and phase-specific information:

1. Site Address;
2. Calculated Risk Level (2 or 3);
3. Site Stormwater Manager Information including the name, company, and 24-hour emergency telephone number;
4. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number;
5. Stormwater Sampling Agent information including the name, company, and 24-hour emergency telephone number;
6. Activities associated with each construction phase;
7. Trades active on the construction site during each construction phase;
8. Trade contractor information; and
9. Suggested actions for each project phase.

An example template REAP is provided in Appendix C of this handbook.

SECTION 5 Training

Include a statement about training requirements and documentation.

The General Permit requires (Section VII) that all elements of the SWPPP be developed by a QSD and implemented by a QSP. The QSP may delegate tasks to trained employees provided adequate supervision and oversight is provided.

Personnel at the site shall receive training appropriate for individual roles and responsibilities on the project. Appropriate personnel shall receive training on SWPPP implementation, BMP inspection and maintenance, and record keeping. Document all training activities (formal and informal) and retained a record of training activities in SWPPP Appendix K. Training documentation must also be submitted in the Annual Report.

SECTION 6 Responsible Parties and Operators

6.1 Responsible Parties

The General Permit requires (Section VII.B.4) that the name of any "Approved Signatory" be listed in the SWPPP, and a copy of the written agreement or other mechanism that provides this authority from the LRP be provided in the SWPPP.

A list of authorized representatives should be provided in this section or in an appendix to the SWPPP (e.g., SWPPP Appendix L) along with project site personnel who will be responsible for SWPPP activities, including the QSD and QSP. This list should include the names of the individuals granted authority to sign permit-related document.

Include copies of the written authorizations for duly authorized representatives in the appendix. The appendix or list should include the name and contact information for the individual, their role on the project, date of training, and date of recorded entry as well as a copy of training certificates or other verification of training.

6.2 Contractor List

The General Permit requires (Section VII.B.5) that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the QSP.

Include this list in this section or in an appendix to the SWPPP (e.g., SWPPP Appendix M). *The list is required to include telephone numbers and work addresses and the specific areas of responsibility of each subcontractor and emergency contact numbers.*

SECTION 7 Construction Site Monitoring Program

7.1 Purpose

The General Permit (Attachments C, D, E; Section I.1.a) requires that a written site specific Construction Site Monitoring Program (CSMP) be developed by each discharger prior to the commencement of construction activities, and be revised as necessary to reflect project revisions and that the CSMP be included with the SWPPP. The CSMP should be developed to meet the specific requirements and objectives identified in the General Permit for each risk level. A suggested format is provided below (Sections 7.2 through 7.9 of this annotated outline). Include the CSMP as SWPPP Appendix N. The CSMP shall include monitoring procedures and instructions, location maps, forms, and checklists, a description of the project site's watershed, including drainage patterns and all site discharge locations. Additionally, the CSMP should describe NAL/NEL thresholds for the site. See Appendix D of this handbook for additional guidance on developing a CSMP.

7.2 Applicability of Permit Requirements

General Permit monitoring requirements for stormwater and non-stormwater visual observations; stormwater and non-stormwater sample collection; and receiving water monitoring shall be described in the CSMP. Requirements vary based on the project risk level. The CSMP shall identify the applicable monitoring requirements; and, inspection, observation, and sample collection frequency based on the project's risk level.

The applicability section of the CSMP should also identify the qualifying storm event for stormwater related observations and sample collection as well as permit-specified sampling/observation exemptions.

7.3 Monitoring Locations

Maps and descriptions should be provided for each of the project's observation and/or sample collection locations; including identification of locations specific to particular project phases or watershed as applicable. Instructions or criteria for access shall be included.

Risk Level 3 sites should identify receiving water monitoring locations should this monitoring be required.

7.4 Safety

A description of site hazards and safety information related to conducting visual observations or sample collection, particularly in inclement weather, shall be included in the CSMP.

7.5 Visual Monitoring (Inspections)

Identify requirements, frequencies, and provide inspection checklists for non-stormwater and stormwater observations.

Section 3.1 of Appendix D (of this handbook) provides details of the visual monitoring requirements.

7.6 Water Quality Sampling and Analysis

The level of detail and the amount of information provided in this section will depend upon the risk level determined for the site as part of the PRDs. See Section 3.2 of Appendix D of this handbook for more details on sampling and analysis.

All Sites are required to monitor runoff for non-visible pollutants in the event of a BMP failure, breach, or spill. An area unaffected by the failure, breach, or spill must also be sampled to serve as the basis of comparison.

Risk Level 2 and 3 sites are required to collect:

- Samples of runoff and contained rainwater (when it is released) from qualifying storm events and analyze samples for pH and turbidity.
- Samples of non-stormwater (authorized and unauthorized) to characterize the discharge.

Risk Level 3 sites may additionally be required to collect:

- Samples of runoff from qualifying storm events and analyze samples for suspended sediment concentration (SSC); and
- Collect samples in the receiving water for pH, turbidity and SSC if NELs are exceeded in runoff samples.

Sites using ATS are required to collect samples related to operation of the ATS. However, this sampling should be detailed in the ATS Plan and only referenced in the CSMP.

Risk Level 3 sites that meet the thresholds identified in General Permit Appendix 3 are required to conduct bioassessment monitoring

The CSMP should include specific details about sample collection frequency; sample constituents; sample collection methodologies (including clean sample collection techniques); and use of pH and turbidity field meters and field quality assurance/quality control.

Sample procedures for laboratory analysis should also be described (in the event of non-visible pollutant monitoring or other required laboratory sample analysis, e.g. SSC). These procedures should include which laboratory will be performing the sample analysis and how samples will be delivered to the laboratory, laboratory analytical methods and reporting limits, sample container requirements and required sample volume; field and laboratory quality assurance/quality control, and chain of custody procedures.

7.7 Watershed Monitoring Option

Sites that participate in a qualified regional watershed-based monitoring program should describe their participation and the elements of the General Permit monitoring requirements that have been suspended by the RWQCB in lieu of the watershed monitoring. Include a copy of the RWQCB approval of the watershed monitoring program.

7.8 Quality Assurance and Quality Control

Include any details of the Quality Assurance and Quality Control plan that have not be described in Section 7.6

7.9 Reporting Requirements and Records Retention

The CSMP shall clearly identify information required to be recorded during observations and sample collection through the use of checklists and field forms. The CSMP should include directions on report storage and retention requirements. See Appendix D Section 6.0, and Section 8.0, of this handbook.

Additionally, reporting requirements for standard reporting and violations (e.g., NEL Violation Report and NAL exceedance via the SMARTS system) should be clearly identified for the site's risk level.

List of Appendices

Appendix C
Rain Event Action Plan Template

Rain Event Action Plan (REAP)

Date:		**WDID Number:**	
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Site Information:

Site Name, City and Zip Code Project Risk Level: □ Risk Level 2 □ Risk Level 3

Site Stormwater Manager Information:

Name, Company, Emergency Phone Number (24/7)

Erosion and Sediment Control Contractor – Labor Force contracted for the site:

Name, Company, Emergency Phone Number (24/7)

Stormwater Sampling Agent:

Name, Company, Emergency Phone Number (24/7)

Current Phase of Construction

Check ALL the boxes below that apply to your site.

- ❑ Grading and Land Development
- ❑ Vertical Construction
- ❑ Inactive Site
- ❑ Streets and Utilities
- ❑ Final Landscaping and Site Stabilization
- ❑ Other:

Activities Associated with Current Phase(s)

Check ALL the boxes below that apply to your site (some apply to all Phases).

Grading and Land Development:

- ❑ Demolition
- ❑ Vegetation Removal
- ❑ Vegetation Salvage-Harvest
- ❑ Rough Grade
- ❑ Finish Grade
- ❑ Blasting
- ❑ Soil Amendment(s):
- ❑ Excavation (_____ ft)
- ❑ Soils Testing
- ❑ Rock Crushing
- ❑ Erosion and Sediment Control
- ❑ Surveying
- ❑ Equip. Maintenance/Fueling
- ❑ Material Delivery and Storage
- ❑ Other:

Streets and Utilities:

- ❑ Finish Grade
- ❑ Utility Install: water-sewer-gas
- ❑ Paving Operations
- ❑ Equip. Maintenance/Fueling
- ❑ Storm Drain Installation
- ❑ Material Delivery & Storage
- ❑ Curb and Gutter/Concrete Pour
- ❑ Masonry
- ❑ Other:

Vertical Construction:

- ❑ Framing
- ❑ Carpentry
- ❑ Concrete/Forms/Foundation
- ❑ Masonry
- ❑ Electrical
- ❑ Painting
- ❑ Drywall/Interior Walls
- ❑ Plumbing
- ❑ Stucco
- ❑ Equip. Maintenance/Fueling
- ❑ HVAC
- ❑ Tile
- ❑ Exterior Siding
- ❑ Insulation
- ❑ Landscaping & Irrigation
- ❑ Flooring
- ❑ Roofing
- ❑ Other:

Final Landscaping & Site Stabilization:

- ❑ Stabilization
- ❑ Vegetation Establishment
- ❑ E&S Control BMP Removal
- ❑ Finish Grade
- ❑ Storage Yard/ Material Removal
- ❑ Landscape Installation
- ❑ Painting and Touch-Up
- ❑ Irrigation System Testing
- ❑ Other:
- ❑ Drainage Inlet Stencils
- ❑ Inlet Filtration
- ❑ Perm. Water Quality Ponds
- ❑ Other:
- ❑ Other:
- ❑ Other:

Inactive Construction Site:

- ❑ E & S Control Device Installation
- ❑ Routine Site Inspection
- ❑ Trash Removal
- ❑ E & S Control Device Maintenance
- ❑ Street Sweeping
- ❑ Other:

Rain Event Action Plan (REAP)

Date:		**WDID Number:**	

Trades Active on Site during Current Phase(s)
Check ALL the boxes below that apply to your site

❑ Storm Drain Improvement	❑ Grading Contractor	❑ Surveyor- Soil Technician
❑ Street Improvements	❑ Water Pipe Installation	❑ Sanitary Station Provider
❑ Material Delivery	❑ Sewer Pipe Installation	❑ Electrical
❑ Trenching	❑ Gas Pipe Installation	❑ Carpentry
❑ Concrete Pouring	❑ Electrical Installation	❑ Plumbing
❑ Foundation	❑ Communication Installation	❑ Masonry
❑ Demolition	❑ Erosion and Sediment Control	❑ Water, Sewer, Electric Utilities
❑ Material Delivery	❑ Equipment Fueling/Maintenance	❑ Rock Products
❑ Tile Work- Flooring	❑ Utilities, e.g., Sewer, Electric	❑ Painters
❑ Drywall	❑ Roofers	❑ Carpenters
❑ HVAC installers	❑ Stucco	❑ Pest Control: e.g., termite prevention
❑ Exterior Siding	❑ Masons	❑ Water Feature Installation
❑ Insulation	❑ Landscapers	❑ Utility Line Testers
❑ Fireproofing	❑ Riggers	❑ Irrigation System Installation
❑ Steel Systems	❑ Utility Line Testers	❑ Other:

Trade Contractor Information Provided
Check ALL the boxes below that apply to your site.

❑ Educational Material Handout	❑ Tailgate Meetings	❑ Training Workshop
❑ Contractual Language	❑ Fines and Penalties	❑ Signage
❑ Other:	❑ Other:	❑ Other:

Continued on next page.

Rain Event Action Plan (REAP)

Date of REAP		**WDID Number:**	
Date Rain Predicted to Occur:		**Predicted % chance of rain:**	

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. Each active Trade should check all material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work to ensure the proper implementation of BMPs. Project-wide BMPs should be checked and cross-referenced to the BMP progress map.

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
❑ Information & Scheduling	❑ Inform trade supervisors of predicted rain ❑ Check scheduled activities and reschedule as needed ❑ Alert erosion/sediment control provider ❑ Alert sample collection contractor (if applicable) ❑ Schedule staff for extended rain inspections (including weekends & holidays) ❑ Check Erosion and Sediment Control (ESC) material stock ❑ Review BMP progress map ❑ Other:______________________________________ ❑ ____ ❑ ____
❑ Material storage areas	❑ Material under cover or in sheds (ex: treated woods and metals) ❑ Perimeter control around stockpiles ❑ Other:______________________________________ ❑ ____ ❑ ____________________________________
❑ Waste management areas	❑ Dumpsters closed ❑ Drain holes plugged ❑ Recycling bins covered ❑ Sanitary stations bermed and protected from tipping ❑ Other:______________________________________ ❑ ____ ❑ ____
❑ Trade operations	❑ Exterior operations shut down for event (e.g., no concrete pours or paving) ❑ Soil treatments (e.g.,: fertilizer) ceased within 24 hours of event ❑ Materials and equipment (ex: tools) properly stored and covered ❑ Waste and debris disposed in covered dumpsters or removed from site ❑ Trenches and excavations protected ❑ Perimeter controls around disturbed areas ❑ Fueling and repair areas covered and bermed ❑ Other:______________________________________ ❑ ____ ❑ ____________________________________
❑ Site ESC BMPs	❑ Adequate capacity in sediment basins and traps ❑ Site perimeter controls in place ❑ Catch basin and drop inlet protection in place and cleaned ❑ Temporary erosion controls deployed ❑ Temporary perimeter controls deployed around disturbed areas and stockpiles ❑ Roads swept; site ingress and egress points stabilized ❑ Other:______________________________________ ❑ ____ ❑ ____________________________________
❑ Concrete rinse out area	❑ Adequate capacity for rain ❑ Wash-out bins covered ❑ Other:______________________________________ ❑ ____ ❑ ____________________________________
❑ Spill and drips	❑ All incident spills and drips, including paint, stucco, fuel, and oil cleaned ❑ Drip pans emptied ❑ Other:______________________________________ ❑ ____ ❑ ____________________________________

Continued on next page.

❑ Other / Discussion / Diagrams	❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________ ❑ ____________________

Attach a printout of the weather forecast from the NOAA website to the REAP.

I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

____Date: ____________________

Qualified SWPPP Practitioner (Use ink please)

Appendix D
Field Monitoring and Analysis Guidance

1.0 Purpose of Document, Compliance Notification, and Limitations

The purpose of this guidance document is to assist dischargers subject to the General Permit. Dischargers who have questions about specific requirements of the General Permit, or this guidance document are advised to consult with the appropriate Regional Water Quality Control Board (RWQCB). Failure to comply with the General Permit can result in significant administrative, civil, and criminal penalties.

Users of this document should note the following:

- The scope of this document is limited to providing guidance on developing a Construction Site Monitoring Program (CSMP) required by the General Permit.
- The scope of this document is limited to traditional construction projects and does not address the monitoring requirements for Linear Underground/Overhead Projects (LUPs). While general information such as sampling techniques is transferrable, LUP operators should refer to Attachment A of the General Permit for details of the monitoring requirements.
- The purpose of this document is to provide general information to assist dischargers through the process of developing a CSMP. Sampling and analysis strategies must be site-specific for each individual project.
- This guidance document identifies the key elements of Active Treatment System (ATS) monitoring. Dischargers choosing to implement an ATS should work with the ATS provider to develop and implement a detailed ATS monitoring program tailored to the site specific ATS design.
- Bioassessment monitoring is covered briefly in the text of this guidance document. Additional details are provided in Appendix E of the handbook.
- Regulatory interpretations may change over time as a result of new information, new court cases, or new laws. Dischargers should consult with their regulators for current interpretations.
- RWQCBs and local agencies may require additional monitoring that is not addressed by this document. Dischargers should consult with the RWQCB and local agencies to determine if there are additional requirements.
- The sampling and analysis requirements of General Permit are governed by National Pollutant Discharge Elimination System (NPDES) regulations. These regulations and state regulations implementing the NPDES program contain significant requirements regarding quality assurance, quality control, qualifications of analytical laboratories, etc., which may not be explicitly addressed in this document. Consult with the NPDES regulations or RWQCB staff to determine any additional requirements.

- Compliance with this guidance document does not automatically equate to compliance with the General Permit.

1.1 Structure of Document

This document is organized to assist a discharger through the process of developing a site-specific CSMP and provides tools to assist the discharger conducting monitoring. Table D-1 provides a quick reference to the sections of the document.

A CSMP outline is included in the annotated Stormwater Pollution Prevention Plan (SWPPP) outline in Appendix B of this handbook.

Table D-1 Quick Section Reference

Topic	Section
Traditional construction site monitoring	3
Active treatment system monitoring	4
Quality assurance/quality control	5
Reporting and records retention	6
Guidance on field measurements	7
Example data collection forms	8

2.0 Summary of Construction Site Monitoring Requirements and Purpose of Monitoring

The General Permit requires that all construction projects develop and implement a site-specific CSMP. The CSMP must include the monitoring procedures and instructions, location maps, forms, and checklists necessary to implement the visual and water quality monitoring required for the site. The CSMP is developed prior to the start of construction activities and is part of the SWPPP. Like the SWPPP, the CSMP may need to be revised to reflect and adapt to changes in the project.

2.1 Types of Monitoring Required by the General Permit

The General Permit requires the following types of monitoring:

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff;
- Sampling and analysis of receiving waters;
- Sampling and analysis of non-stormwater discharges;
- Bioassessment monitoring of receiving waters;
- Sampling and analysis of ATS operations; and
- Soil particle size analysis.

The specific monitoring required for each construction site depends upon the project risk level, project size, BMPs implemented and effluent quality. Tables D-2, D-3, and D-4 summarize the monitoring requirements by risk level.

Table D-2 Summary of Risk Level 1 Monitoring Requirements

Type of Monitoring		When
Sampling & Analysis	Non-visible pollutants: spill/BMP failure based on pollutant source assessment	Within first two hours of discharge from site. Collect samples of runoff affected by the spilled or released material(s) and runoff that is unaffected by the spilled or released material(s).
	Particle size	When sediment basins are used. If needed to justify site specific sediment risk using the Revised Universal Soil Loss Equation (RUSLE).
	Other	RWQCB or Total Maximum Daily Loads (TMDLs) may require other monitoring.
Visual Inspections	Non-stormwater inspection	Quarterly for each drainage area.
	Qualifying rain event: Pre-rain inspection	All drainage areas, BMPs, and stormwater containments within two business days of each qualifying rain event.
	Qualifying rain event: Post-rain inspection	All discharge locations within two business days after each qualifying rain event. Visually observe discharge of contained stormwater when discharged.
	During rain inspection	See BMP inspection below.
	BMP	Weekly and every 24 hours during extended storm events.

Table D-3 Summary of Risk Level 2 Monitoring

Type of Monitoring		When
Sampling & Analysis	Effluent sampling: Turbidity	Collect a minimum of three samples per day. Collect runoff samples representative of site discharges.
	Effluent sampling: pH	During construction phases with high risk of high pH discharge. Collect a minimum of three samples per day. Collect runoff samples representative of site discharges.
	Non-visible pollutants: spill/BMP failure based on pollutant source assessment	Within first two hours of discharge from site. Collect samples of runoff affected by the spilled or released material(s) and runoff unaffected by the spilled or released material(s).
	Contained rain water	At time of discharge.
	Non-stormwater	At locations where discharged off the site.
	Particle size	When sediment basins are used. If needed to justify site specific sediment risk using RUSLE.
	Other	RWQCB or TMDLs may require other monitoring.
Visual Inspections	Non-stormwater inspection	Quarterly for each drainage area.
	Qualifying rain event: Pre-rain inspection	All drainage areas, BMPs, and stormwater containments within two business days of each qualifying rain event.
	Qualifying rain event: Post-rain inspection	All discharge locations within two business days after each qualifying rain event. Visually observe discharge of contained stormwater when discharged.
	During rain inspection	See BMP inspection below.
	BMP	Weekly and every 24 hours during extended storm events.

Table D-4 Summary of Risk Level 3 Monitoring

Type of Monitoring		When
Sampling & Analysis	Effluent sampling: pH, Turbidity	Collect a minimum of three samples per day. Collect runoff samples representative of site discharges.
	Effluent sampling: pH	During construction phases with high risk of high pH discharge. Collect a minimum of three samples per day. Collect runoff samples representative of site discharges.
	Effluent sampling: Suspended Sediment Concentration (SSC)	SSC required only if turbidity exceeds Numeric Effluent Limitation (NEL). Collect a minimum of three samples per day. Collect runoff samples representative of site discharges.
	Non-visible pollutants: spill/BMP failure based on pollutant source assessment	Within first two hours of discharge from site. Collect samples of runoff affected by the spilled or released material(s) and runoff unaffected by the spilled or released material(s).
	Contained rain water	At time of discharge.
	Receiving water sampling	If an NEL is exceeded at a project that has a direct discharge to the receiving water, subsequently sample receiving water for turbidity and SSC (if turbidity NEL exceeded), and pH (if pH NEL exceeded). Sample upstream and downstream of point of discharge in to receiving water.
	Bioassessment	Projects 30 acres or greater that directly discharge to wadeable stream. See Appendix E of the handbook for more information on bioassessment monitoring. Conduct monitoring up- and down-stream of point of runoff discharge into the receiving water. Conduct monitoring before start of construction activity and after completion.
	Non-stormwater	At locations where discharged off the site.
	Particle size	When sediment basins are used. If needed to justify site specific sediment risk using RUSLE.
	Other	RWQCB or TMDLs may require other monitoring.

Continued

Table D-4 Summary of Risk Level 3 Monitoring

Type of Monitoring		When
Visual Inspections	Non-stormwater inspection	Quarterly for each drainage area.
	Qualifying rain event: Pre-rain inspection	All drainage areas, BMPs, and stormwater containments within two business days of each qualifying rain event.
	Qualifying rain event: Post-rain inspection	All discharge locations within two business days after each qualifying rain event. Visually observe discharge of contained stormwater when discharged.
	During rain inspection	See BMP inspection below.
	BMP	Weekly and every 24 hours during extended storm events.

2.2 Purpose of the Construction Site Monitoring Program

The purpose of the CSMP is to address the following objectives:

- To demonstrate that the site is in compliance with the applicable discharge prohibitions, Numeric Action Levels (NALs), or Numeric Effluent Limitations (NELs);
- To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
- To determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges; and
- To determine whether BMPs included in the SWPPP and/or Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

2.3 Implementing a CSMP

The General Permit includes specific requirements regarding the implementation of SWPPPs and CSMPs. Each construction site must have a Qualified SWPPP Practitioner (QSP) to oversee the implementation of the CSMP including the BMP inspections, rain-event triggered inspections, and the collection of water quality samples. The QSP may delegate any or all of these activities to an employee trained to do the task(s) but the QSP must supervise the delegated tasks.

3.0 Traditional Construction Site Monitoring

The General Permit distinguishes between traditional construction projects and LUPs. This section addresses the requirements of traditional site monitoring (as identified in General Permit Attachments C, D, and E). While general information such as sampling techniques is transferrable, LUP operators should refer to General Permit Attachment A for details of the LUP monitoring requirements. Requirements specific to ATS, as identified in General Permit Attachment F, are addressed in Section 4 of this guidance document.

Monitoring at construction sites includes visual monitoring (inspections) and sampling and analysis. As noted in Section 2, monitoring requirements vary based on the project risk level.

3.1 Visual Monitoring (Inspection)

All sites (Risk Levels 1, 2, and 3) are required to conduct visual monitoring (inspections). Visual monitoring includes inspections of BMPs, inspections before and after qualifying rain events, and inspection for non-stormwater discharges. Visual inspections are required for the duration of the project with the goal of confirming that appropriately selected BMPs have been implemented, are being maintained, and are effective in preventing potential pollutants from coming in contact with stormwater.

3.1.1 BMP Inspections

The General Permit requires that BMPs be inspected weekly and once each 24-hour period during extended storm events. The purpose of these inspections is to identify BMPs that:

- Need maintenance to operate effectively;
- Failed; or
- Could fail to operate as intended.

If deficiencies are identified during BMP inspections, repairs or design changes to BMPs must be initiated within 72 hours of identification and need to be completed as soon as possible.

All BMP inspections must be documented on an inspection checklist. Check with the State Water Resources Control Board (SWRCB) or local RWQCB to see if they have a preferred inspection checklist to use as a template or guide for the BMP checklist. The checklist should be made site specific based on the BMPs and outfalls for each construction project, but at minimum the form should include:

- Inspection date and date the inspection report was written;
- Weather information, including presence or absence of precipitation, estimate of the beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches;
- Site information, including stage of construction, activities completed, and approximate area of the site exposed;
- A description of the BMPs evaluated and any deficiencies noted;
- If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations, and identify any projected maintenance activities;
- Report the presence of noticeable odors or any visible sheen on the surface of any dischargers;
- Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates;
- Photographs taken during the inspection, if any; and
- Inspector's name, title, and signature.

An example Visual Inspection Field Log Sheet is included in Section 8.0 of this guidance document, and an electronic copy of the form (Microsoft Word®) can be downloaded from the CASQA BMP Handbook web site at http://www.casqa.org. This form is suitable to document the basic information needed for BMP inspection, but must be supplemented with a site-specific BMP inspection checklist.

3.1.2 Qualifying Rain Event Inspections

The General Permit requires that the construction site be inspected within two days prior to a predicted qualifying rain event is and within two days after a qualifying rain event. These inspections are only required during normal business hours of the construction site.

> **Qualifying Rain Event**
>
> The General Permit defines a *qualifying rain event* as one that produces ½-inch or more of precipitation with a 48 hour or greater period between rain events.

The General Permit requires that dischargers only use weather forecasts from the National Oceanographic and Atmospheric Administration (NOAA). Pre-project inspections should be initiated after consulting NOAA for a qualifying rain event with 50%or greater probability of precipitation (PoP). These forecasts can be obtained at http://www.srh.noaa.gov/.

Records must be kept of all qualifying rain event inspections. Records need to be maintained on site and document:

- Personnel performing the observations;
- Observation dates (time and date);
- Weather conditions (including the rain gauge reading for the qualifying rain event);
- Locations observed; and
- Corrective actions taken in response to observations.

An example of a Visual Inspection Field Log Sheet is included in Section 8.0 of this guidance document.

3.1.2.1 Pre-Rain Event Inspection

The purpose of the pre-rain event inspection is to make sure the site and the BMPs are ready for the predicted rain. The pre-rain event inspection needs to cover:

- All stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- All BMPs to identify whether they have been properly implemented per the SWPPP and/or REAP;
- Stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- The presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants within stored stormwater.

3.1.2.2 Post-Rain Event Inspection

The purpose of the post-rain event inspection is to observe the discharge locations and the discharge of any stored or contained rainwater; determine if BMPs functioned as designed; and identify if any additional BMPs are required. The post-rain event inspection needs to cover:

- All stormwater discharge locations;
- The discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event; and
- All BMPs to determine if they were adequately designed, implemented, and effective. After assessing BMPs it should be noted on the inspection form whether the BMPs need maintenance.

3.1.3 Non-Stormwater Discharges Inspections

The General Permit requires that construction sites, regardless of risk level, be inspected quarterly for the presence of non-stormwater discharges. Records must be kept of all inspections and must be maintained on site.

Non-stormwater discharge inspections are only required during normal business hours of the construction site. The purpose of these inspections is to detect unauthorized non-stormwater discharges and observe authorized non-stormwater discharges. Quarterly inspections need to include each drainage area of the project and document:

- Presence or indications of unauthorized and authorized non-stormwater discharges and their sources;
- Pollutant characteristics of the non-stormwater discharge (floating and suspended material, sheen, discoloration, turbidity, odor, etc;
- Personnel performing the observations;
- Dates and approximate time each drainage area and non-stormwater discharge was observed; and
- Response taken to observations.

If the site is Risk Level 2 or 3 and there are non-stormwater discharges, then samples must be collected and analyzed.

An example Visual Inspection Field Log Sheet is included in Section 8.0 of this guidance document.

3.2 Water Quality Sampling and Analysis Procedures

The purpose of sampling is to determine whether BMPs implemented on a construction site are effective in controlling potential construction site pollutants, which come in contact with stormwater or non-stormwater, and to demonstrate compliance with the applicable NALs or NELs.

This section discusses the procedures and the information that need to be included in the CSMP for water quality sampling and analysis. This section is divided into the following:

- Potential pollutant sources;
- Monitoring constituents by risk level;
- Sampling locations;
- Sample collection and handling; and
- Analytical methods, laboratories, and field meters.

Water quality sampling and analysis is required for all Risk Level 2 and 3 projects. Typically, Risk Level 1 projects are not required to conduct water quality sampling and analysis unless there is a risk of non-visible pollutant discharge.

3.2.1 Potential Pollutant Sources

3.2.1.1 Sediment and Turbidity

Conditions or areas at a construction site that may cause sediment, silt, and/or turbidity in site runoff include:

- Exposed soil areas with inadequate erosion control measures;
- Areas of active grading;
- Poorly stabilized slopes;
- Lack of perimeter sediment controls;
- Areas of concentrated flow on unprotected soils;
- Poorly maintained erosion and sediment control measures;
- Tracking sediment onto roads and paved surfaces;
- Unprotected soil stockpiles; and
- Failure of an erosion or sediment control measure.

3.2.1.2 High pH

Conditions or areas at a construction site that may cause high pH in site discharges include:

- Concrete pours and curing;
- Concrete waste management areas;
- Soil amendments (e.g. fly ash and lime); and
- Mortar and stucco mixing, application, and waste management areas.

3.2.1.3 Non-Visible Pollutants

Monitoring for pollutants not visually detectable is only required if those pollutants are determined to be potentially present in stormwater leaving the construction site; and is typically the result of a BMP failure or spill on the construction site. This determination is documented in the pollutant source assessment in the SWPPP.

Projects should attempt to eliminate the exposure of construction materials to prevent stormwater pollution and limit sampling and analysis requirements. It is important to note that covered construction materials or those that are in their final constructed form, do not need to be monitored. Materials that are stored exposed to precipitation and may generate runoff need to be considered for non-visible pollutant monitoring.

Non-visible pollutants may also exist on the project site as a result of the land use prior to the start of the construction activity. To determine the potential of pollutants to exist on the construction site as a result of past land use activities, dischargers should review existing environmental and real estate documentation. Good sources of information on previously existing contamination and past land uses include, but are not limited to, the following:

- Initial Studies or Environmental Impact Reports (EIRs) prepared under the requirements of the California Environmental Quality Act (CEQA);
- Environmental Assessments or Environmental Impact Statements (EIS) prepared under the requirements of the National Environmental Policy Act (NEPA); and
- Phase I Assessments prepared for property transfers.

Non-visible pollutants in site discharges may result from materials that:

- Are being used in construction activities;
- Are stored on the construction site;
- Were spilled during construction operations and not cleaned up;
- Were stored (or used) in a manner that presented the potential for a release of the material during past land use activities;
- Were spilled during previous land use activities and not cleaned up; or
- Were applied to soil as part of past land use activities.

3.2.2 Monitoring Constituents by Risk Level

Risk Level 1

- Risk Level 1 projects are only required to collect water quality samples if there is a BMP breach, malfunction, leakage, or spill. Water quality samples should be taken for non-visible pollutants that may have been discharged from the site as identified in the site pollutant source assessment (see Section 3.2.1 of this guidance document).
- Particle size analysis may be needed if a Risk Level 1 project is using a sediment basin or if needed to justify a site specific risk level calculation using the Revised Universal Soil Loss Equation (RUSLE). The particle size analysis provides the information needed to determine the K-factor.

Risk Level 2

- At a minimum, Risk Level 2 projects are required to collect water quality samples for pH (during construction phases with a high risk of high pH discharge) and turbidity (all phases). Additional monitoring may be required by the RWQCB.
- Risk Level 2 projects are required to collect water quality samples if there is a BMP breach, malfunction, leakage, or spill. Water quality samples should be taken for non-visible pollutants that may have been discharged from the site as identified in the site pollutant source assessment (see Section 3.2.1 of this guidance document).
- Particle size analysis may be needed if a Risk Level 2 project is using a sediment basin or if needed to justify a site specific risk level calculation using RUSLE. The particle size analysis provides the information needed to determine the K-factor.

Risk Level 3

- Risk Level 3 projects are required to collect water quality samples for pH (during construction phases with a high risk of high pH discharge) and turbidity (all phases). Additional monitoring may be required by the RWQCB.

- Risk Level 3 projects are required to collect water quality samples if there is a BMP breach, malfunction, leakage, or spill. Water quality samples should be taken for non-visible pollutants that may have been discharged from the site as identified in the site pollutant source assessment (see Section 3.2.1 of this guidance document).
- Particle size analysis may be needed if a Risk Level 3 project is using a sediment basin or if needed to justify a site specific risk level calculation using RUSLE. The particle size analysis provides the information needed to determine the K-factor.
- Risk Level 3 projects must collect water quality samples for suspended sediment concentration (SSC) if the turbidity NEL is exceeded. Once triggered, SSC monitoring must continue until the project has been completed.
- Additionally, Risk Level 3 projects must conduct a bioassessment study consistent with the General Permit (See Appendix E of the handbook for more information on bioassessment monitoring.)

3.2.3 Sampling Locations

3.2.3.1 Stormwater Runoff

Risk Level 2 and 3 projects are required to collect water quality samples of runoff that is discharged off-site. Samples must be representative of the runoff associated with construction activity from the entire project disturbed area. Samples locations representative of runoff in each drainage area should be considered to ensure adequate representation of the flow and characteristics of the site's discharges.

3.2.3.2 Non-Stormwater Runoff

Risk Level 2 and 3 projects are also required to collect water quality samples to characterize authorized and unauthorized non-stormwater discharged from the site.

3.2.3.3 Receiving Water

Following the exceedance of a NEL at a Risk Level 3 project that has a direct discharge to the receiving water, the project is required to collect receiving water samples for the duration of the construction project. Samples must be taken at representative upstream/upgradient and downstream/downgradient locations as close as possible to the point where the site's runoff enters the receiving water. If there are two or more discharge locations discharging to the same receiving water, only one upstream and one downstream sampling locations is required. Samples should only be collected from safe accessible locations.

Projects required to conduct bioassessment monitoring must identify monitoring locations up-stream and downstream of the point where construction site runoff enters the wadeable stream. Sampling events must occur before the start of ground disturbing activities during the appropriate index period and must be repeated after the completion of construction (at least one winter season after project related ground disturbance has ceased).

3.2.3.4 Non-Visible Pollutant Monitoring

In situations where a breach, malfunction, leakage, or spill has occurred, dischargers must collect a sample of runoff that has come into contact with the no come in contact with the materials and must also collect a runoff sample that has not come into contact materials (uncontaminated sample) for comparison.

3.2.4 Sample Collection and Handling

It is important to use the correct methods to collect and handle samples to ensure the samples are valid. While the handling requirements apply primarily to grab samples collected for laboratory analysis, field measurements can be affected by sample collection procedures.

The General Permit requires dischargers to designate and train personnel to collect, maintain, and ship water quality samples in accordance with the *Surface Water Ambient Monitoring Program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP)*, which is available at http://www.swrcb.ca.gov/water_issues/programs/swamp/tools.shtml#qa.

Sampling methods, handling procedures, and locations should be identified in advance of the sampling event in order to provide sufficient time to gather the supplies and equipment necessary to sample and plan for safe access by the sampling crew(s).

Adherence to SWAMP sampling guidance and proper development of a sampling plan provides for consistent, reproducible, and accurate results. For some constituents, especially trace metals, trace organics, and organic carbon, sampling protocols are very important as contamination of samples due to incorrect sampling protocols is possible. Design of the field sampling procedures should carefully consider contamination potential from sample location (e.g., sediment disturbances, equipment exhaust), sampling techniques, and sample handling. Field crews should be trained in the appropriate site specific methods specified in the sampling plan. "Clean sampling" based on the US Environmental Protection Agency (EPA) Method 1669 should be used when sufficiently low detection concentrations are expected for at least trace metals and mercury. However, it is recommended that all sampling plans incorporate a "clean technique" approach including the following protocols:

- Samples (for laboratory analysis) are collected only in analytical laboratory-provided sample containers;
- Clean, powder-free nitrile gloves should be worn for collection of samples;
- Gloves are changed whenever something not known to be clean has been touched;
- Decontaminate all equipment (e.g. bucket, tubing) except laboratory provided sample containers, prior to sample collection using a trisodium phosphate (TSP)-soapy water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water); and
- To reduce potential contamination, sample collection personnel must adhere to the following rules while collecting samples:
  - No smoking;
  - Never sample near a running vehicle;
  - Do not park vehicles in the immediate sample collection area (even non-running vehicles);
  - Do not eat or drink during sample collection; and
  - Do not breathe, sneeze, or cough in the direction of an open sample container.

Water quality samples should be collected in appropriate sample containers and be of adequate volume to conduct the required measurements or laboratory analyses.

The most important aspect of grab sampling is to make sure that the sample best represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below. Note, however that depending upon the specific test that is required, some bottles may contain preservatives. These bottles should never be dipped into the stream, but filled indirectly from the collection container.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.

ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.

iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.

iv. Avoid collecting samples from ponded, sluggish or stagnant water.

v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

All sampling and sample preservation must be in accordance with the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association).

SSC samples should be taken as a normal grab sample, where the bottle is submerged facing upstream and filled. SSC samples need to be collected in a separate bottle because the analysis requires the entire volume of the bottle. Many grab samples can be partitioned out of a larger container used to collect the samples for various analyses but that is not the case for SSC.

All samples must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Shipped samples should be placed inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Many analytical methods have short hold-times before which the analysis must be started. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless otherwise required by the analytical laboratory).

Most sites will require the use of some sort of field meter to measure turbidity and pH. Some field meters can be placed directly in the flow of water and gather instantaneous data. Meters with probes that can be directly placed into the flow are ideal, however low flow conditions may not allow for this type of measurement. In this case, grab samples can be collected and placed within the field meter's recording container. Section 7.0 of this guidance document provides step-by-step instructions using an example field meter.

All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Many manufacturers provide step-by-step instructions for the use and calibration of their meters and these instructions should be followed.

If using field meters, pH and turbidity measurements should be conducted immediately (i.e. samples should not be stored for later measurement).

Collect proper information regarding time and sampling conditions, appropriately label the bottles, and fill out the required chain of custody forms and field logs.

3.2.5 Analytical Methods, Laboratories, and Field Meters

All laboratory analyses must be conducted according to analytical procedures specified in 40 Code of Federal Regulations (CFR) Part 136, unless other analytical procedures have been specified in the General Permit or by the RWQCB. With the exception of field analyses conducted by the discharger for turbidity and pH, all analyses must be sent to and conducted by a state-certified analytical laboratory. Currently, the SSC method is not state certified and a limited number of laboratories have the capability of doing this analysis.

Analytical laboratories should be contacted and a contract should be worked out before the wet season to minimize potential disruptions during the critical sampling period. A laboratory should be chosen foremost by their accreditation, ability to perform the required samples in the desired turn-around-time, and then by their proximity for ease of sample delivery. Although with overnight mail delivery, proximity is less important, it may still be an important factor to avoid bottle breakage during shipment.

State-certified analytical laboratories can be found by using the Environmental Laboratory Accreditation Program's (ELAP) website at:
http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx.

The analytical method/protocol, minimum detection limits, and reporting units for the water quality constituents specifically identified in the General Permit are presented in Table D-5.

Table D-5 Water Quality Constituent Analytical Method / Protocol, Minimum Detection Limits, Sample Size and Container Requirements

Parameter	Test Method/Protocol	Minimum Detection Limit	Minimum Sample Volume	Container Type
pH	Field meter or pH test kit	0.2 pH Units	NA	Plastic
Turbidity	Field meter or EPA 180.1	1 NTU	500 mL	Plastic
SSC	ASTM Method D 3977-97	5 mg/L	200 mL	Contact Lab

Non-visible pollutants may include a wide range of analytical methods. A list of potential non-visible pollutants based on common construction activities is shown in Table D-6. This list is not meant to be inclusive but to provide general guidance for projects. Consult with the analytical laboratory or 40 CFR Part 136 to identify specific analytical methods, sample volume, and containers needed for the expected non-visible pollutants.

Dischargers can perform pH analysis on site with a calibrated pH meter, or pH test kit. Dischargers can perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on site or at an accredited analytical laboratory.

Many manufacturers offer single parameter meters or multiple parameter meters with various optional probes. Dischargers will need to determine the best type of meter for their individual situation. Any meter selected for field monitoring should have the ability to be calibrated, be accompanied by detailed operation instructions, and should be ruggedly designed for field use and long term storage (you are unlikely to need it during the dry season).

Table D-6 Potential Non-Visible Pollutants based on Common Construction Activities

Activity	Potential Pollutant Source	Laboratory Analysis
Water line flushing	Chlorinated water	Residual chlorine
Portable toilets	Bacteria, disinfectants	Total/fecal coliform
Concrete & Masonry	Acid wash Curing compounds Concrete rinse water	pH pH, alkalinity, Volatile organic compounds (VOCs) pH
Painting	Resins Thinners Paint Strippers Solvents Adhesives Sealants	Semi-volatile organic compounds (SVOCs) Phenols, VOCs VOCs Phenols, VOCs Phenols, SVOCs SVOCs
Cleaning	Detergents Bleaches Solvents	Methylene Blue Activated Substances (MBAS), phosphates Residual chlorine VOCs
Landscaping	Pesticides/Herbicides Fertilizers Lime and gypsum Aluminum sulfate, sulfur	Check with analytical laboratory $NO_3/NH_3/P$ Acidity/alkalinity Total dissolved solids (TDS), alkalinity
Treated wood	Copper, arsenic, selenium	Metals
Soil amendments & dust control	Lime, gypsum Plant gums Magnesium chloride Calcium chloride Natural brines Lignosulfonates	pH Biochemical oxygen demand (BOD) Alkalinity, TDS Alkalinity, TDS Alkalinity, TDS Alkalinity, TDS

Hand held single parameters are usually the least costly and are designed with a user friendly interface. Multi-parameter meters are more costly, but provide increased versatility, have user friendly interfaces, and can provide instantaneous readings of multiple parameters. Probes for the multi-parameter meters can be attached to cables of varying lengths that make it possible to sample at a greater distance from the runoff flow.

Hach, Hydrolab, Global Water, Fisher Scientific, and LaMott are some known manufacturers and/or vendors of turbidity and pH meters. Whichever turbidimeter is selected, it is important to use the same meter; different meters may have different results even if properly calibrated. If you need to use several turbidimeters, then assign to each meter to a specific location.

Bioassessment sampling and analysis is conducted according to Appendix 5 of the General Permit. Bioassessment sampling protocols are defined by *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode, 2007). Bioassessment laboratory protocols are defined by Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (Richards and Rogers, 2006). Bioassessments are conducted before the start of ground disturbing activities and after these activities are completed. More information on bioassessment monitoring is provided in Appendix E of this handbook.

Dischargers utilizing a sediment basin are required to conduct a soil particle analysis. Dischargers may also want to conduct this analysis to establish site-specific particle size information, which can be used to justify the project risk level using RUSLE. (The particle size analysis provides the K factor.) The soil particle analysis is conducted using the American Society for Testing and Materials (ASTM) test method ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, to determine the percentages of sand, very fine sand, silt, and clay on the site. The percentages of particles less than 0.02 mm in diameter must also be determined. This analysis is conducted before construction starts and is reported with the Permit Registration Documents (PRDs).

3.3 Watershed Monitoring Option

Dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the sampling and analysis requirements. The RWQCB may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of the General Permit.

3.4 Monitoring Exemptions

Dischargers are not required to physically collect samples or conduct visual observations during dangerous weather conditions (flooding, electrical storms, etc.) or outside of scheduled construction site business hours. An explanation must be provided in the Annual Report if a project was unable to collect required samples or visual observations because of dangerous weather conditions.

4.0 Active Treatment System Monitoring

4.1 Introduction

Projects choosing to use ATS are subject to additional monitoring requirements specific to operation of the ATS. An ATS is defined in the General Permit as any system that utilizes chemical coagulation, chemical flocculation, or electrocoagulation to reduce turbidity caused by fine suspended sediment. Typically an ATS is considered for use as a BMP at sites with sediment sensitive receiving waters, high concentrations of fine clayey soils, limited space for sediment control structures, or long and steep slopes.

The General Permit specifies a turbidity NEL for ATS discharge that is different than the NEL for Risk Level 3 sites, and sets limits for chemical residual and toxicity (Table D-7).

Table D-7 Summary of ATS discharge limitations

Parameter	Limitation	ATS Type
Turbidity	10 NTU daily flow-weighted average and 20 NTU single sample maximum	All
Chemical residual	10% or less of Maximum Allowable Threshold Concentration (MATC)	Flow-through systems
Toxicity	no allowable toxic effects	Batch systems

This section identifies special inspection and sampling requirements, protocols, and methodologies required for operation of an ATS. These generally include:

- Influent and effluent flow, turbidity, and pH monitoring;
- Effluent toxicity and chemical residuals testing;
- Dose-rates and adjustments for chemical treatment and pH adjustment;
- Laboratory and field Quality Assurance (QA) requirements specific to ATS; and
- Recordkeeping and reporting requirements.

4.1.1 Types of ATS

An ATS can be designed as a batch treatment system using either ponds or portable trailer-mounted tanks, or as a flow-through system using any number of proprietary system designs.

4.1.1.1 Batch Treatment

Batch treatment systems consist of the stormwater collection system (either temporary diversion or the permanent site drainage system); a sediment basin, trap or holding tanks for untreated runoff; pumps; a chemical feed system; treatment cells; and, interconnecting piping. Batch treatment systems should use a minimum of two lined treatment cells. Generally, untreated runoff is pumped from the holding basins/tanks, through a chemical injection system into treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be basins, traps, or tanks. Portable tanks may also be suitable for some sites. The General Permit requires that batch treatment systems have a filtration step to remove residual floc prior to discharge.

4.1.1.2 Flow-through Treatment

At a minimum, a flow-through ATS system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), an untreated stormwater storage pond or holding tank, and a chemically enhanced filtration system.

Stormwater is collected throughout the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area. The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced filtration system where polymer is added. Adjustments to pH may be necessary before chemical addition. The filtration system continually monitors the stormwater for turbidity and pH. If the discharge water is out of the acceptable turbidity or pH range, the water is recycled to the untreated stormwater pond (or holding tank) where it can be retreated.

Figure D-1 provides a schematic of a typical flow-through ATS.

In order to use a flow through system, the General Permit requires that their be a chemical residual test for the coagulation that provides a level of detection at least 10% below than the maximum allowable threshold concentration (MATC). See Section 4.3.1 below.

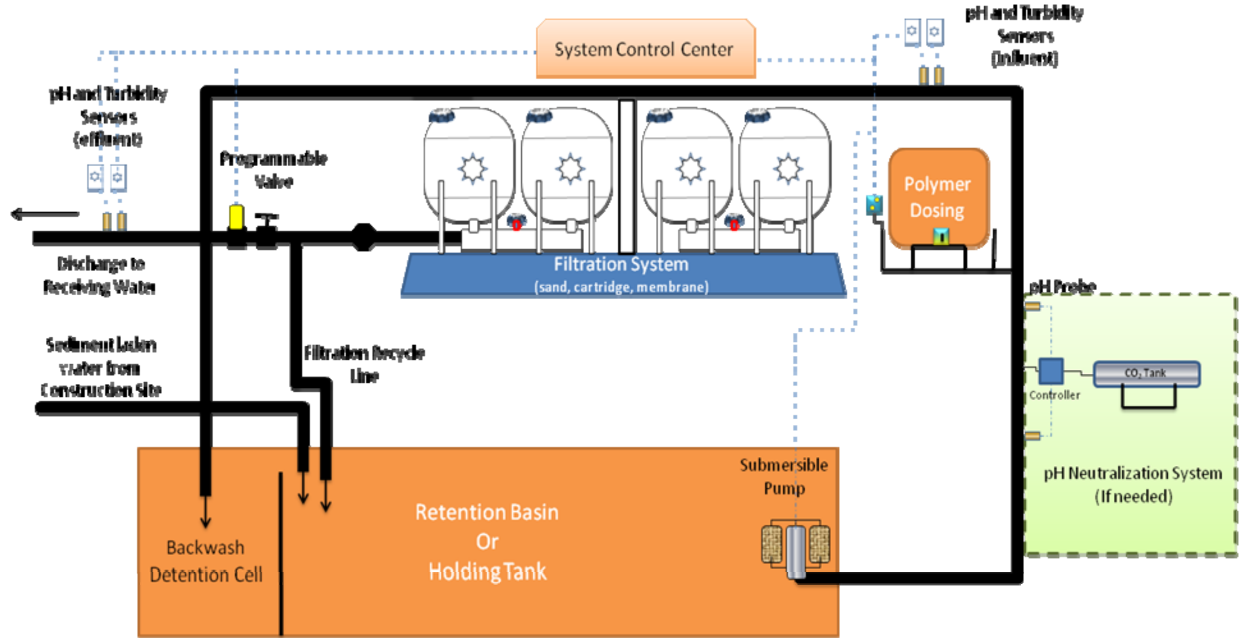


Figure D-1. Typical Flow Through ATS. (Figure adapted from Feldman, 2006.)

4.1.2 ATS Plan

Prior to utilizing an ATS system, the discharger is required to submit an ATS Plan to the SWRCB, which contains the following components:

- ATS Operation and Maintenance Manual for All Equipment;
- ATS Monitoring, Sampling & Reporting Plan (MSRP), including Quality Assurance (QA)/Quality Control (QC);
- ATS Health and Safety Plan;
- ATS Spill Prevention Plan.

As part of the ATS MSRP, and prior to implementing an ATS on a construction site, jar tests are required to be conducted for any chemical/coagulant proposed to be utilized. Jar tests must be conducted according to ASTM D-2035-08, which generally requires simultaneous introduction of an aqueous chemical solution (in different concentrations) to turbid water samples created with site-specific soils contained in six jars set at a specified distance apart, all being actively mixed. Time until particle settling is recorded, and samples from each jar are tested for turbidity, pH, and chemical residual (if test is available). Refer to the ASTM standard for specific requirements. Commercial ATS providers will generally perform jar testing on site-specific soils prior to ATS set-up to determine the appropriate chemical and dosage to optimize settling.

A QA/QC Plan should be prepared as part of the MSRP that is consistent with the QA/QC elements that apply to general field monitoring identified in Section 5.0 of this guidance document. Additional QA/QC requirements specific to ATS include monthly laboratory duplicates to verify chemical residual levels obtained from field measurements, calibration schedules of automated instrumentation (see Section 7.1 of this guidance document), and method detection limits for chemicals being used. These elements should also be included in the required QA/QC Plan.

4.1.3 Required Training for ATS Operation and Monitoring

The General Permit requires that ATS Operators have training specific to using an ATS and liquid coagulants for stormwater discharges. The training is required to consist of a formal class with a certificate and requirements for testing and certificate renewal and include a minimum of eight hours classroom and 32 hours field training. Within the classroom training, the following monitoring components are required:

- ATS Control Systems;
- Coagulant Selection – Jar testing, dose determination, etc.;
- Aquatic Safety/Toxicity of Coagulants – proper handling and safety;
- Monitoring, Sampling, and Analysis;
- Reporting and Recordkeeping; and
- Emergency Response.

4.2 Visual Monitoring (Inspection)

A designated responsible person is required to be on site daily at all times during treatment operations. Daily on site visual monitoring of the system for proper performance is required to be conducted and recorded in a project field data log. Minimum requirements for the log include:

- Name and phone number of the person responsible for system operation and monitoring;
- Documentation of required training;
- Visual observations of system operation and discharge;
- Date and time of sample collection and flow measurements; and
- Results of field-measured parameters.

4.3 Operational and Compliance Monitoring Procedures

All ATS systems (both batch and flow-through) must have instrumentation that automatically measures and records effluent water quality and flow data. This instrumentation typically will include (1) mounted submersible pH and turbidity probes; (2) data loggers (field-read or internet-based); and (3) a system control panel that provides automatic shut off or recirculation in case of water quality or effluent limitation violation, power-loss, or other catastrophic event. The system control panel must also control coagulant dosing to prevent accidental overdosing. The majority of ATS (including both flow-through and batch systems) will likely be designed, supplied, or monitored by established commercial ATS providers, and these systems must be been designed and instrumented to meet the General Permit criteria. Dischargers choosing to implement a non-proprietary ATS must obtain appropriate equipment to ensure all requirements of the General Permit are met. The following parameters must be monitored continuously and recorded in the project field data log (see Section 5.1 of this guidance document) in no less than 15 minute intervals:

- Flow rate and volume of treated discharge;
- Influent and effluent pH; and
- Influent and effluent turbidity.

The following additional parameters must also be monitored and recorded at the intervals specified below:

- Cumulative flow volume – daily;
- Type and amount of pH adjustment chemical – as utilized;
- Dose rate of treatment chemical – 15 minutes after startup and every 8 hours of operation;
- Residual chemical/additive levels – as proposed in ATS Plan for flow-through systems (see Section 4.3.1 below); and
- Effluent toxicity – for each proposed batch discharge (see Section 4.3.2 below).

All instrumentation used for continuous monitoring must be calibrated on a regular basis with calibration requirements stated in the QA/QC section of the ATS Plan. Calibration is further described in Section 7.1 of this guidance document.

4.3.1 Effluent Residual Chemical Testing – Flow-through systems

The General Permit requires that the effluent from a flow-through system be tested for residual treatment chemicals; however, sample collection frequency is not specified. The residual chemical treatment test must be conducted in accordance with a methodology that is approved by a state-certified laboratory. All sample collection for residual chemical testing should be performed in accordance with sample collection procedures outlined in Section 3.2.4 of this guidance document and should be representative of the discharge from the ATS. Specific protocol for performing the residual test, including required frequency and method detection limits, will need to be developed for each proposed chemical and provided as part of the ATS Plan.

The General Permit requires that a residual chemical test method shall be used that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the species that is most sensitive to the chemical used and that the test be able to be completed within one hour of sample collection (i.e., a short-duration field test). The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for the most sensitive species determined for the specific chemical.

4.3.2 Effluent Toxicity Testing – Batch systems

For batch treatment systems that typically use coagulants for which no chemical residual test has currently been developed (and therefore dischargers cannot use flow-through treatment), dischargers are required to perform Whole Effluent Toxicity (WET) testing on the treated water prior to discharge. All samples collected and shipped for WET testing should be performed in accordance with sample collection and shipping procedures outlined in Section 3.2.4 of this guidance document and other requirements specified by the toxicity laboratory and should be representative of the batch discharge. Samples must be sent to a laboratory certified by the Department of Public Health ELAP to perform WET testing (identifier - E113) in accordance with the 96-hour acute test in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, EPA-841-R-02-012* (USEPA, 2002) for Fathead minnow (*Pimephales promelas*). Acute toxicity testing for Rainbow trout (*Oncorhynchus mykiss*) may be substituted.

The General Permit only requires that the toxicity test be initiated prior to discharging each treated batch.

4.4 Reporting and Record Retention

The General Permit requires the electronic submission of all ATS related field monitoring data, including chemical residual and effluent toxicity testing, to the SWRCB's Stormwater Multi-Application and Report Tracking System (SMARTS) every 30 days, at minimum.

Any monitoring data that violate water quality standards must be reported to the RWQCB. An NEL Violation Report must be electronically filed in SMARTS within 24 hours of identifying an exceedance of an NEL. See Section 6.2 of this guidance document for a discussion of NEL Violation Reports.

All ATS records must also be kept for a minimum of three years after the conclusion of the project (see discussion in Section 6.4 of this guidance document).

5.0 Quality Assurance / Quality Control

An effective QA/QC plan will be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- Sample Chains of Custody (COCs); and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

5.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log.

Examples of field logs to record visual inspections and sample collection and field measurements are provided in Section 8.0 of this guidance document and electronic copies of the forms (Microsoft Word®) can be downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.

5.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed previously, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

5.3 Sample Chain-of-Custody

The sample COC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample COC procedures include the following:

- Proper labeling of samples;
- Use of COC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide COC forms to be filled out for sample containers.

5.4 Data Verification

After analytical results are received from the analytical laboratory, the data should be verified to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data should be verified as soon as the data reports are received.

The COC and laboratory reports need to be checked to make sure all requested analysis were performed and all samples are accounted for in the reports.

Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.

Check data for outlier values and follow up with the laboratory. Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. Attention should be paid to data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.

For laboratory analyses, EPA establishes QA/QC checks and acceptable criteria. These data are typically reported along with the sample results. Data reviewers should evaluate the reported QA/QC data to check for contamination (look at method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.

Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate. Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the expected range. Initial data, even if outside the expected range may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met. If this occurs, the project should obtain a written statement from the analytical laboratory regarding the validity of the sample result.

Similarly, field data needs to be checked as soon as possible to identify potential errors. Reported data and observations should be verified to ensure that it is complete and accurate and as soon as the field logs are received.

Field logs should be checked to make sure all required measurements were completed and appropriately documented. Crews may occasionally miss-record a value. Reported values that appear out of the typical range or inconsistent, should be followed up on immediately to identify potential reporting or equipment problems.

Equipment calibration notations should be verified for outlier data, and if appropriate equipment calibrations should be checked after sampling. Observations noted on the field logs can also help to identify potential interferences. Notations should be made of any errors and actions taken to correct the equipment or recording errors.

When using a field meter it is important to record the value and then make note of any possible meter failures or interferences that could have led to an exceedance. Some possible instrument problems may include the need to recalibrate; the need to replace the battery; problems with the sample container (such as scratches on glass or plastic optical sample cells or particles on the outside of the optical sample cells); or fouled probes.

6.0 Reporting and Records Retention

Most reporting will typically occur in the Annual Report. However, Risk Level 3 dischargers must electronically submit all storm event sampling results (pH and turbidity) to the SWRCB's SMARTS no later than five days after the conclusion of the storm event. Field data related to ATS monitoring must be filed every 30 days.

Additional reporting is required if NALs or NELs are exceeded. The requirements for NAL Exceedance Reports and NEL Violation Reports as well as records retention are discussed in the following sections.

6.1 Numeric Action Level Exceedance Report

In the event that the storm event average of the samples exceeds an applicable NAL, Risk Level 2 and 3 dischargers must electronically submit all storm event sampling results to the SWRCB's SMARTS no later than 10 days after the conclusion of the storm event. (Note, however that Risk Level 3 dischargers must submit all field data regardless of exceedance status within five days of the storm event conclusion).) In addition, the RWQCBs may request the submittal of an NAL Exceedance Report. The discharger must certify each NAL Exceedance Report in accordance with the General Permit's Special Provisions for Construction Activity.

An NAL Exceedance Report must contain the following information:

- Analytical method(s), method reporting unit(s), and MDL(s) of each analytical parameter;
- Date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and
- Description of the current BMPs associated with the sample that exceeded the NAL and the proposed corrective actions taken.

6.2 Numeric Effluent Limitation Violation Report

In the event that the daily average of the samples exceed an applicable NEL, Risk Level 3 dischargers must electronically submit a NEL Violation Report to the SWRCB's SMARTS within 24 hours of identifying the exceedance. ATS dischargers must submit an NEL Violation Report to the SWRCB's SMARTS within 24 hours after the NEL exceedance has been identified. The discharger must certify each NEL Violation Report in accordance with the General Permit's Special Provisions for Construction Activity.

Similar to the NAL Exceedance Report, an NEL Violation Report contains the following information:

- Analytical method(s), method reporting unit(s), and MDL(s) of each analytical parameter;
- Date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

- Description of the current BMPs associated with the effluent sample that exceeded the NEL and the proposed corrective actions taken.

In the event that an applicable NEL was exceeded during a storm event equal to or larger than the Compliance Storm Event (5-year, 24-hour event), Risk Level 3 and ATS dischargers must report the on-site rain gauge reading and nearby governmental rain gauge readings for verification. Projects affected by run-on from a natural disaster (such as a forest fire) are not subject to NELs. Exemption justifications must be entered in to SMARTS.

Risk Level 3 projects and sites using ATS are required to subsequently sample receiving waters for pH, turbidity, and SSC for the duration of coverage under the General Permit if an NEL contained in the General Permit is violated.

6.3 Annual Report

All dischargers are required to prepare and electronically submit an Annual Report no later than September 1 each year. The Annual Reports must be certified in accordance with the Special Provisions in the General Permit. The Annual Report must include the following stormwater monitoring information:

- A summary and evaluation of all sampling and analysis results, including original laboratory reports;
- The analytical method(s), method reporting unit(s), and MDL(s) of each analytical parameter (analytical results that are less than the MDL must be reported as "less than the MDL" or "<MDL");
- A summary of all corrective actions taken during the compliance year;
- Identification of any compliance activities or corrective actions that were not implemented;
- A summary of all violations of the General Permit;
- The individual(s) who performed facility inspections, sampling, visual observation (inspections), and/or measurements;
- The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and
- The visual observations and sample collection exception records and reports.

6.4 Records Retention

Dischargers must retain records of all stormwater monitoring information and copies of all reports (including Annual Reports) for a period of at least three years from date of submittal or longer if required by the RWQCB. ATS dischargers must retain all records for three years after the completion of the construction project. Records are to be kept on site while construction is ongoing. These records include:

- The date, place, and time of facility inspections, sampling, visual observations (inspections), and/or measurements, including precipitation;
- The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;
- The date and approximate time of analyses;

- The individual(s) who performed the analyses;
- A summary of all analytical results from the last three years, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Non-stormwater discharge inspections and visual observations (inspections) and stormwater discharge visual observation records;
- Visual observation and sample collection exemption records
- NAL Exceedance Reports and NEL Violation Reports; and
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations (inspections), or inspections.

Results of field measurements and laboratory analyses must be kept in the SWPPP. It is also recommended that training logs, COCs, and other documentation related to sampling and analysis be kept with the project's SWPPP.

7.0 Guidance on Field Measurements

This section details the general practices for sampling using field meters. Before any sampling begins it is imperative to wear proper clothing and equipment. This includes the appropriate sampling safety equipment and powder-free nitrile gloves.

7.1 Instrument Calibration

Calibrate field meters and equipment before any sampling. Follow the calibration instructions provided by the manufacturer with your instrument. Calibration standards should be purchased with your instrument and repurchased as needed. The standards have limited shelf life and should not be used beyond the expiration date.

Most pH meters require a two or three point calibration curve; therefore you will need to purchase two or three different standard solutions. Typical solutions have pH values of 4, 7, and 10.

Turbidity measurements are also based on a two or three point curve and should include a zero value. It is very important to make sure that the turbidity standard solution is well mixed before meter calibration. Since turbidity standards sometimes contain suspended solids, inaccurate calibration can result if the standards are not properly mixed.

7.2 Field Meter Sampling

Measurement of turbidity and pH using a field meter is very similar. Figure D-2 shows an example of an all-in-one field meter, which among other things, records pH and turbidity. Since methods for specific field meters vary from model to model carefully follow the instructions provided by the manufacturer. This pictorial guide provides an outline for the methods appropriate for an all-in-one meter.

Figure D-2 Example of an All-In-One meter

7.2.1 Measurements in-stream

The simplest method is to place the sensor directly into the waterway or flow path (Figure D-3) and record the results. This will only work if there is significant runoff with a depth greater than six inches, which may not be the case at a construction site. With this method, it is important to not only to have runoff with a significant depth but to sample in a location that is representative of the entire flow. Avoid puddles that might have formed off of the main drainage.

Figure D-3 Measuring pH and turbidity in-stream measurements

7.2.2 Measurements in a sample container

Most likely the sampling will take place in low flow conditions so an intermediate container must be used. The container should be clean and decontaminated. Make sure to obtain a grab sample that represents site runoff conditions.

If two or more runoff streams originating from the site converge at one location downstream from the construction site, then collect a grab sample at this location.

Collect the field sample by holding the container in the flow path (Figure D-4) until enough water is obtained to fill the field meter's receiving container. In some cases, small, clean cups or sampling syringes may be needed to collect an adequate sample volume.

Figure D-4 Collecting grab samples

Figure D-5 Transferring sample to field meter sample container

Next pour the grab sample into the field meter's receiving container (Figure D-5).

Figure D-6 Inserting meter into sample container

Insert field meter into receiving container with the sample water (Figure D-6). This step will differ based on the design of the meter.

Figure D-7 Measuring pH and turbidity in the sample container

Wait for the pH and turbidity values to stabilize before recording the results, which may take few moments.

Complete the field logs (see examples provided in Section 8.0 of this guidance document) with results and any important information to describe the sampling settings. Include in the documentation any apparent odor, color, clarity, sheen, and other visual characteristics of the water sample.

8.0 Example Data Collection Forms

The following are sample field forms that can be used during inspections and sampling events. These forms should be used as guidelines for the development of site specific forms. Dischargers should customize the forms for each project. Customized information can include listing the sampling or observation locations, identifying specific non-visible pollutants, and other site specific notations for field crews.

When modifying the forms make sure that the minimum information required by the General Permit is listed.

Note that the visual observation sample form is not intended to serve as a detailed BMP inspection checklists. The provided form is intended to be a field log to track the general project and rain event information. Detailed BMP inspection forms should be developed as part of the SWPPP based on the planned BMPs.

Electronic copies of the forms (Microsoft Word®) can be downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.

Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***						
Date and Time of Inspection:			Report Date:			
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater
Site Information						
Construction Site Name:						
Construction stage and completed activities:					Approximate area of exposed site:	
Weather and Observations						
Date Rain Predicted to Occur:			Predicted % chance of rain:			
Estimate storm beginning: ____________ (date and time)	Estimate storm duration:__________ (hours)		Estimate time since last storm: _________ (days or hours)		Rain gauge reading: ________ (inches)	
Observations: If yes identify location						
Odors	Yes ☐	No ☐				
Floating material	Yes ☐	No ☐				
Suspended Material	Yes ☐	No ☐				
Sheen	Yes ☐	No ☐				
Discolorations	Yes ☐	No ☐				
Turbidity	Yes ☐	No ☐				
Site Inspections						
Outfalls or BMPs Evaluated	**Deficiencies Noted**					
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:			
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:			Inspector Title:			
Signature:					Date:	

Risk Level 2
Effluent Sampling Field Log Sheets

Construction Site Name:	Date:	Time Start:
Sampler:		

Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant

Field Meter Calibration

pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected

Discharge Location Description	Sample Type	Time

Additional Sampling Notes:

Time End:

Risk Level 3 Effluent Sampling Field Log Sheets				
Construction Site Name:		Date:		Time Start:
Sampler:				
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant	☐ Post NEL Exceedance

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements

Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected

Discharge Location Description	SSC	Other (specify)	Time

Additional Sampling Notes:
Time End:

Risk Level 3 ***Receiving Water Sampling Field Log Sheets***			
Construction Site Name:		Date:	Time Start:
Sampler:			
Receiving Water Description and Observations			
Receiving Water Name/ID:			
Observations:			
Odors	Yes ☐	No ☐	
Floating material	Yes ☐	No ☐	
Suspended Material	Yes ☐	No ☐	
Sheen	Yes ☐	No ☐	
Discolorations	Yes ☐	No ☐	
Turbidity	Yes ☐	No ☐	
Field Meter Calibration			
pH Meter ID No./Desc.: Calibration Date/Time:		Turbidity Meter ID No./Desc.: Calibration Date/Time:	
Field pH and Turbidity Measurements and SSC Grab Sample			
Upstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		
Downstream Location			
Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		
Additional Sampling Notes:			
Time End:			

Appendix E
Bioassessment Summary and Resources

Bioassessment is a method of evaluating the structure of a biological community (e.g., invertebrates, fish, and algae) in a receiving water body to determine its ecological condition, compared to an applicable reference condition. Bioassessments have been conducted for decades in many states, and more recently have gained popularity in California as indicators of ecological condition in wadeable streams. Specifically, benthic macroinvertebrate bioassessments are currently conducted in California by the State Water Resources Control Board's (SWRCB) Surface Water Ambient Monitoring Program (SWAMP) and many Phase I municipal stormwater programs.

The General Permit requires that projects meeting all of the following requirements must conduct or participate in a benthic macroinvertebrate bioassessment of the receiving waters:

- Risk Level 3 or Linear Underground/Overhead Projects (LUP) Type 3 project; and
- Project disturbs 30 acres or more; and
- Project directly discharges runoff to a freshwater wadeable stream (or streams) that has all of the following three existing beneficial uses: SPWN **and** COLD **and** MIGR; and/or is either (a) listed by the SWRCB or US Environmental Protection Agency (EPA) as impaired due to sediment or (b) is tributary to any downstream water body that is so listed.

Projects required to conduct bioassessment monitoring must select sites upstream and downstream of the point where runoff from the construction site enters the wadeable stream. Sampling events must occur **before the start** of ground disturbing activities and **must be repeated after the completion of construction** (at least one winter season that generates runoff after project related ground disturbance has ceased).

The bioassessment includes the collection of in-stream biological data and in-stream physical habitat data.

Macroinvertebrate samples must be taken during the during the appropriate index period, that is the time of year most appropriate for bioassessment sampling. The index period depends upon the ecoregion. In general, the index period is in the late spring to early fall. The SWRCB maintains an index period map at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Projects that begin outside of the appropriate index period for their area may qualify for a sampling exception and pay into the SWAMP program. The Regional Water Quality Control Board (RWQCB) must approve the sampling exception. To qualify for an exception projects must:

1. Receive RWQCB approval for the sampling exception.

2. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the Waste discharger Identification (WDID) number on the check for the amount calculated for the exempted project.

3. Send a copy of the check to the RWQCB office for the site's region.

4. Invest $**7,500 times the number of samples required** into the SWAMP program as compensation.

Bioassessment sampling must be performed in according to the protocols identified in Appendix 5 of the General Permit covering field collection and laboratory methods, quality assurance, data reporting, and invasive species control.

Field data collection methods for macroinvertebrates

Bioassessment field data collection methods are identified in the *Reachwide Benthos (Multi-habitat) Procedure*, specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode, 2007). Available at: http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf.

Anyone who collects fish, amphibians, or invertebrates from the waters of the state must have a California Department of Fish and Game (DFG) Scientific Collecting Permit (SCP) in their possession. The SCP can be obtained from the DFG License and Revenue Branch in Sacramento (916) 928-5849. Additional information and the SCP application can be obtained from: http://www.dfg.ca.gov/wildlife/nongame/research_permit/. For additional information on bioassessment contractors, please contact the RWQCB or a Phase I municipal stormwater program representative in your project area.

Habitat assessment methods

Concurrent with the collection of macoinvertebrates the full suite of physical habitat characteristics must be measured according to *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode, 2007). These requirements are summarized in the *Surface Water Ambient Monitoring Program's Stream Habitat Characterization Form — Full Version*. The most recent update, March 2009, is available at: http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/03/swamp_ba_field_data_sheets_v25_033009.pdf.

Laboratory methods

Macroinvertebrates should be identified and classified using a fixed-count of 600 organisms per sample according to the Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (SAFIT), which is available at: http://www.safit.org/Docs/ste_list.pdf.

Only trained and professional entomologists should conduct the identification and classification of macroinvertebrates. For a list of trained professional entomologists familiar with the California STE, see http://www.safit.org.

Quality assurance

The bioassessment monitoring plan must include a bioassessment quality assurance (QA) plan that includes an external QA check performed by the DFG Aquatic Bioassessment Laboratory (http://www.dfg.ca.gov/abl/) on one sample per calendar year or 10% of the samples, whichever is greater. An alternative laboratory with equivalent of better expertise and performance may be used if approved in writing by the SWRCB staff.

The SWAMP recently released a Quality Assurance Project Plan for bioassessment monitoring, available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/smcqappfinal.pdf.

Sample preservation and archiving

Original samples must be archived pending the completion of QA sampling, including the external QA checks. The remaining sample after completing the recommended reanalysis must be archived and preserved for three years and must be relinquished to the SWRCB upon request. See Appendix 5 of the General Permit for additional information on archiving requirements.

Data reporting and submittal

Data must be submitted in an electronic form to the SWRCB. Standardized formats for reporting bioassessment data to the SWAMP are currently in development. All bioassessment data collected after those formats become available must be submitted using the SWAMP formats. Until those formats are available, the biological data should be submitted in Microsoft Excel ® (2000 or later) format.

Physical/habitat data must be reported using the standard format titled *SWAMP Stream Habitat Characterization Form — Full Version*, http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/fieldforms_fullversion052908.pdf.

Invasive species prevention

Special care must be taken when conducting bioassessment monitoring to prevent the introduction and spread of aquatic invasive species. In particular, to prevent the spread of the New Zealand Mudsnail, samplers conducting bioassessments must follow DFG's recommendations to prevent the spread of this invasive species. Available at: http://www.dfg.ca.gov/invasives/mudsnail.

Other information on aquatic invasive species is available at: http://www.waterboards.ca.gov/water_issues/programs/swamp/ais/.

Most of the above noted references are maintained at the SWRCB's SWAMP website. These references and additional information on bioassessment are available at: http://www.waterboards.ca.gov/water_issues/programs/swamp/.

Much of the bioassessment work and development of sampling protocols are developed and maintained by SAFIT. SAFIT is a nonprofit organization of scientists and citizen volunteers collaboratively working to standardize the taxonomy of inland freshwater invertebrates in the southwest United States. SAFIT maintains the documents and tools it develops on its website: http://www.safit.org/.

Appendix F
Guidance on Selection of Temporary Slope Stabilization Techniques

Temporary stabilization is an important step in protecting a construction site; by providing effective erosion control through stabilization, generated sediment can be significantly reduced.

Selecting Temporary Stabilization Measures

Stabilization measures can vary significantly in cost, effectiveness, means and ease of installation, and longevity. Each construction site has unique site factors and faces a unique set of challenges. Site factors should be compared to the relative costs and functionality of the various stabilization methods to select the most appropriate methods for the area to be stabilized. Temporary stabilization measures should be selected by the Qualified SWPPP Developer (QSD) prior to implementation, with the site erosion and sediment control strategy evaluated and optimized throughout construction. The following Best Management Practice (BMP) characteristics are presented to assist in selection of stabilization methods. These factors include:

- Functional Longevity of the BMP
- Seasonality (Project Timing) and Climate
- Site accessibility
- Material availability
- Slope inclination
- Soil Type and Condition
- Estimated BMP effectiveness
- Cost effectiveness

Functional Longevity of the BMP

As shown in the TableF-1, each temporary stabilization technique has an estimated period of relative effectiveness. Estimating the required longevity of the temporary stabilization method is the first step in selecting a technique. The length of time required to (1) establish adequate temporary vegetation density or (2) protect the soil until redisturbance should be considered. Estimating time to vegetation establishment should include a factor of safety for unknown weather conditions (drought) that may lengthen the actual time to achieve vegetative stabilization. Once the required longevity is known, and the BMPs have been screened for that specific time frame, all other factors in this section should be considered prior to making a decision regarding temporary stabilization. The Table F-1 provides a guideline for initial consideration of temporary stabilization techniques. The table is structured so that the shortest lasting techniques are presented at the top, with increasing longevity as you move down. It should be noted that any technique from a higher longevity category can be utilized for a lower category; however, might not be as cost effective or easy to install. This table is not inclusive of all temporary stabilization methods available; additional temporary stabilization methods, including proprietary products, should be selected based on manufacturer's recommendations of longevity.

Table F-1 Guidelines for Temporary Stabilization Techniques

Required Longevity	Temporary Stabilization Method	Associated Fact Sheet
< 6 months	Hydraulic Mulching (Paper/Cellulose Fiber, Wood Fiber without tackifier)	EC-3
	Soil Binders – Short Lived Plant Based	EC-5
	Straw Mulch	EC-6
	Compost Blanket – (depth 1-inch or less)	EC-14
6 - 12 months	Hydraulic Mulch (wood fiber with tackifier)	EC-3
	Bonded/Stabilized Fiber Matrices	
	Straw Blanket	EC-7
	Wood Fiber Blanket	
	Compost Blanket – (depth 2-inch)	EC-14
	Soil Binders – Long Lived Plant Based and Cementitous	EC-5
12 – 18 months	Soil Binders - Polymeric Emulsion Blends	EC-5
	Jute Blanket	EC-7
	Compost Blanket – (depth 3-inch or greater)	EC-14
>18 months	Straw/Coconut Blanket	EC-7
	Coconut Blanket	
	Synthetic Matting	
	Wood Chips (Flat surfaces only)	EC-8

Seasonality (Project Timing) and Climate

While timing construction to occur during the dry, summer season can be beneficial to preventing erosion due to lack of precipitation, it can have a negative effect on stabilization efforts that include a vegetative component for the same reason. If temporary stabilization efforts include a vegetative component, the time of year when those measures are applied must be considered when choosing the longevity of the BMP (and may require an irrigation component). Very hot and dry climates can also decrease the standard longevity of stabilization BMPs as presented; if specifying stabilization measures in extremely hot climates, factor this into the selection criteria. If temporary stabilization measures are applied in the rainy, winter season, it is important to consider drying time and soil moisture requirements/limitations when selecting soil stabilization methods.

Site Accessibility

Projects that are generally close to roads capable of supporting trucks are generally not limited in their selection of temporary stabilization BMPs. As the distance of the area requiring stabilization increases from a roadway, the choices for stabilization become more limited. For instance, blown-straw mulching and hydraulic applications from a mounted sprayer are typically feasible within approximately 150 feet of a roadway or alternate safe truck access way; and pneumatically applied compost is typically feasible within approximately 300 feet of a roadway or access way. Hand application of straw and compost, or running very long hose runs (which are capable of reaching distances of up to 1000 feet) from a hydraulic mulcher can be much more costly due to required increase in labor.

Material Availability

Depending on site location and the timing of application, specific stabilization products may not be locally available, may have significant cost constraints on shipping to a project location, or, required application equipment or contractors may not be available for use or hire in the timeframe required (especially prior to the rainy season or predicted storm events). For this reason, it is important to assess product and contractor availability prior to the immediate need for temporary stabilization. If possible, temporary stabilization BMP materials should be acquired during the initial stages of construction and should be maintained (under cover or in storage) until their use is required. Materials should not be stored outside as exposure to sun and rain can decrease their functional longevity once installed.

Slope Inclination

Temporary stabilization techniques will vary based upon the slope of the area requiring stabilization. Most temporary stabilization methods presented in the fact sheets can be considered for slopes gentler than 2:1 (H:V), with the exception of wood mulch stabilization (which can be highly transportable even on relatively flat slopes). For slopes 2:1 (H:V) or greater, stabilization can be achieved using high-durability erosion control blankets (Straw/Coconut or Coconut Fiber – See EC-7) or chemically or mechanically bonded hydraulic applications (BFM, SFM, MBFM – See EC-3). Slopes steeper than 1:1 (H:V) or steep rocky slopes may require stabilization methods not presented in this manual, including anchored wire mesh, shotcrete, or other structural solutions (such as retaining walls) and should be designed and specified by a licensed engineer.

Soil Type and Condition

Soil type and condition should be determined prior to selecting any hydraulic application, including the use of Soil Binders (EC-5) for temporary stabilization. Soil binders can be soil-type specific, so it is important to characterize your site soils prior to selection. For instance, polyacrylamides (PAMs) do not function well in sandy soils; therefore stand-alone PAM or using a hydraulic mulch with a PAM tackifier is not appropriate under these conditions. In addition to soil type, the condition of the soil can also play a significant role in selection of a specific soil stabilization technique. Soils that are wet or saturated may prohibit the use of certain hydraulic applications that require a specific drying time and soils that are too dry may require wetting or conditioning prior to application. Soil type does not generally affect erosion control blanket or mat (EC-7) installations; however, uneven or rocky slopes can prevent their proper application. Soils must have uniform contact with erosion control blankets and mats for them to be effective.

Estimated BMP Effectiveness

While the majority of temporary stabilization techniques presented are effective at preventing erosion when properly applied, there are some that perform better than others. For instance, hydraulic mulch applied without tackifier (such as guar) is estimated to be only 50-60% effective as a stand-alone measure; however, with a tackifier included, effectiveness estimates increase to 65-99%. It is generally good practice to combine sediment control techniques (e.g., slope interruption, barriers at the top and bottom of slope) with temporary stabilization techniques; however, it is essential when utilizing a technique that does not have 90-99% estimated effectiveness. Multiple measures (temporary stabilization combined with sediment control) should also be utilized when erosion could cause potential property damage or direct impacts to receiving waters down slope.

Cost Effectiveness

While the primary driver behind selecting temporary stabilization should be prevention of erosion and its associated environmental impacts, it is important to maintain cost-effectiveness while implementing these measures. Once all other factors have been considered and a list of potential BMPs has been developed, the relative cost of those BMPs should be considered when making a final decision. Proper stabilization of difficult terrain or complex areas should not be compromised based on cost decisions; proper stabilization techniques and their potential cost should be considered prior to initiating construction in difficult or steep terrain. Estimated costs for temporary stabilization techniques are provided in the individual fact sheets and in the table below; however, can vary greatly by region and season and should be assessed for each individual project.

Table F-2 Temporary Stabilization Comparison Table

Surface Mulch Category	Unit Cost Installed	Estimated Relative Erosion Control Effectiveness	Standard Application Rate	Ease of Installation
Hydraulic Mulching Types: Wood, paper, cellulose fiber	\$900–1,200/ac	50 – 60%	2,000 lbs per acre	2
Compost Application	\$1,500-\$5,000/ac \$5,000-15,000/ac \$10,000-20,000/ac	40 – 50% 95 - 99% 95 - 99%	(1" blanket application) (2" blanket application) (3" blanket application)	3 3 3
Straw Mulching Types: Rice and wheat	\$1,800–2,100/ac	90 – 95%	2 tons per acre	3
Wood Chip Types: Blanket	\$900–1,200/ac	Unknown		3
Hydraulic Matrices Types: Wood mulch + Granular or liquid binder Paper mulch + Granular or liquid binder Cellulose mulch + binder	\$1,000-2,000/ac	65 - 99%	2,000 lbs/ac mulch + 10% tackifier	2 2 2
Bonded Fiber Matrices	\$5,000–6,500/ac	90 – 99%	3,500 – 4,000 lbs/ac	3
Rolled Erosion Control Products				
Types: Biodegradable				
Jute	\$6,000–7,000/ac	65 – 70%	N/A	4
Curled Wood Fiber	\$8,000–10,500/ac	90 – 99%	N/A	4
Straw	\$8,000–10,500/ac	90 – 99%	N/A	4
Wood Fiber	\$8,000–10,500/ac	90 – 99%	N/A	4
Coconut Fiber	\$13,000–14,000/ac	90 – 99%	N/A	4
Coconut Fiber Net	\$30,000–33,000/ac	90 – 99%	N/A	4
Straw Coconut	\$10,000–12,000/ac	90 – 99%	N/A	4
Non-Biodegradable				
Plastic Netting	\$2,000–2,200/ac	< 50%	N/A	4
Plastic Mesh	\$3,000–3,500/ac	75 – 80%	N/A	4
Synthetic Fiber w/Netting	\$34,000–40,000/ac	90 – 99%	N/A	4
Bonded Synthetic Fibers	\$45,000–55,000/ac	90 – 99%	N/A	5
Combination Synthetic and Biodegradable Fibers	\$30,000–36,000/ac	85 – 99%	N/A	5