DOCKETED	
Docket Number:	07-AFC-06C
Project Title:	Carlsbad Energy Center - Compliance
TN #:	231222
Document Title:	Storm Water Pollution Prevention Plan (SWPPP) SOIL&WATER-1
Description:	SWPPP for the Demolition of Encina Power Station
Filer:	Anwar Ali
Organization:	Carlsbad Energy Center LLC
Submitter Role:	Applicant
Submission Date:	12/13/2019 3:38:26 PM
Docketed Date:	12/13/2019

CALIFORNIA ENERGY COMMISSION

December 13, 2019

Mr. George Piantka
Director Regulatory Environmental Service
NRG Energy, Inc., West Region
4600 Carlsbad Boulevard
Carlsbad, California 92008

SUBJECT: ENCINA POWER STATION/AMENDED CARLSBAD ENERGY CENTER PROJECT (07-AFC-06C) – APPROVAL OF DEMOLITION PLANS

Dear Mr. Piantka:

In accordance with the Conditions of Certification, staff has reviewed and approved the following plans:

- Public Notification Process (**NOISE-1**);
- Noise Control Plan (**NOISE-3**);
- Storm Water Pollution Prevention Plan (**SOIL&WATER-1**);
- Non-Potable Water Use Plan (**SOIL&WATER-2**);
- Traffic Control Plan (**TRANS-1**); and
- Waste Management Plan (**WASTE-5**).

If you have any questions or concerns, please contact Anwar Ali, Compliance Project Manager, at (916) 654-5020, or by fax to (916) 654-3882, or via e-mail at anwar.ali@energy.ca.gov.

Sincerely,

Jonathan Fong
Compliance Office Supervisor
Siting, Transmission, and Environmental Protection Division

Stormwater Pollution Prevention Plan (SWPPP)
Encina Power Station Demolition

Cabrillo Power I LLC
Encina Power Station: Carlsbad, California

WDID#: 9 37C388251
Risk Level: 2
BMcD Project No. 115381

SWPPP Preparation Date: 09/13/2019
Construction Start Date: 10/01/2019
Construction Completion Date: 12/31/2021

Stormwater Pollution Prevention Plan (SWPPP)
Encina Power Station Demolition

prepared for

Cabrillo Power I LLC
Encina Power Station: Carlsbad, California

WDID#: 9 37C388251
Risk Level: 2

Legally Responsible Person (LRP):
Cabrillo Power I LLC
4600 Carlsbad Boulevard
Carlsbad, CA 92008

Jerry Carter
Phone: 760-268-4011

SWPPP Prepared by:
Aaron Christensen

SWPPP Reviewed by:
QSD: Simon Barber #23921
Burns & McDonnell Engineering Company, Inc.
400 Oyster Point Blvd., Suite 533
South San Francisco, California 94080

SWPPP Preparation Date: 09/13/2019
Construction Start Date: 10/01/2019
Construction Completion Date: 12/31/2021

Legally Responsible Party
Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Encina Power Station Demolition

WDID: **9 37C388251**

"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

Jerry Carter
Legally Responsible Party

10/3/2019
Date

Signature of Jerry Carter

760-268-4011
Telephone

Plant Manager

Qualified SWPPP Developer
Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Encina Power Station Demolition

WDID: **9 37C388251**

"This Stormwater Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ and Order 2012-0006-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of that date signed below."

2019-10-02

QSD Signature | *Date*

Simon Barber | #23921

QSD Name | *QSD Certificate Number*

Senior Geologist, Burns & McDonnell | 650-871-2661

Title and Affiliation | *Telephone Number*

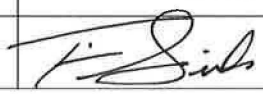
Sbarber@burnsmcd.com

Email

Authorization of Data Submitters

Project Name: Encina Power Station Demolition

WDID #: 9 37C88251

Name of Personnel	Project Role	Company	Signature	Date
Simon Barber	QSD/P	Burns & McDonnell		2019-10-02
Timothy Sisk	Manager, Env. Business	NRG Energy		10/2/19

LRP/Approved Signatory's Signature

10/3/2019
Date

Approved Signatory

760-268-4011
Telephone Number

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
AC	Asphalt Concrete
AST	Above Ground Storage Tank
ATS	Active Treatment System
BAT/BCT	Best Available Technology/Best Control Technology
bgs	Below Ground Surface
BMP	Best Management Practices
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
C.F.R.	Code of Federal Regulations
CASQA	California Stormwater Quality Association
CoC	Chain-of-Custody
CSMP	Construction Soil Management Plan
CWM	Construction Waste Management Plan
DOT	United States Department of Transportation
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
EPS	Encina Power Station
EPP	Environmental Protection Plan
ft	Feet
General Permit	Construction General Permit Order No. 2009-0009-DWQ
HAZWOPER	Hazardous Waste Operations and Emergency Response
IPaC	Information for Planning and Consultation
LRP	Legally Responsible Person
MS4	Municipal Separate Storm Sewer System
msl	Mean Sea Level
NAL	Numeric Action Level
NES	Numeric Effluent Standard
NOAA	United States National Oceanic & Atmospheric Administration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Unit
PCC	Plain Cement Concrete
PFDC	Precipitation Frequency Data Services
Poseidon	Poseidon Water
PPE	Personal Protective Equipment
PRD	Permit Registration Documents
QA/QC	Quality Assurance/Quality Control
QRSE	Qualifying Rain Event/Qualifying Storm Event
QSD	Qualified Stormwater Developer
QSP	Qualified Stormwater Practitioner
REAP	Rain Event Action Plan

Abbreviation	Term/Phrase/Name
RECP	Rolled Erosion Control Products
Regional Water Board	California Regional Water Quality Control Board
RUSLE	Rainfall Erosivity Factor Calculator
SDG&E	San Diego Gas and Electric
SDS	Safety Data Sheets
SMARTS	Stormwater Multi Application and Report Tracking System
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
UST	Underground Storage tank
WDID	Waste Discharge Identification Number

1.0 SWPPP REQUIREMENTS

1.1 Introduction

The Encina Power Station (EPS) was an oil burning power generation plant constructed in 1953. Operations at EPS ceased on December 11, 2018, after the construction and startup of the Carlsbad Energy Center. New planned work at EPS will include demolition of several structures of the facility including turbine halls, boilers, maintenance shop, fuel oil room, control houses, stack, and water treatment facility and associated tanks.

The purpose of this Storm Water Pollution Prevention Plan (SWPPP) is to describe measures implemented to prevent or reduce storm water pollutants that may be discharged from the areas of the EPS during the demolition of the structures associated with EPS. Portions of the EPS that are authorized by other water discharge permits are not covered by this SWPPP.

This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association (CASQA) Stormwater *Best Management Practice Handbook Portal: Construction* (CASQA, 2012). In accordance with the California Construction General Permit (General Permit)[1], Section XIV, this SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site Best Management Practices (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;
- Calculations and design details as well as BMP controls are complete and correct, as presented in Appendix A.

1.2 Permit Registration Documents

Required Permit Registration Documents (PRDs) shall be submitted to the California State Water Resources Control Board (State Water Board) via the Stormwater Multi Application and Report Tracking

[1] 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. California State Water Resources Control Board-Division of Water Quality.

System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

- Notice of Intent (NOI);
- Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
- Site Map;
- Annual Fee;
- Post-construction water balance calculation;
- Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
- SWPPP.

Site maps and drawings are presented in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP Availability & Implementation

The discharger shall make the SWPPP available at the construction site during working hours (Monday – Saturday 0700-1730) while construction is occurring and shall be made available upon request by the Regional Water Board, State Water Board, NRG Environmental Manager, 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. (General Permit Section XIV.C) The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP Amendments

The SWPPP should be revised in the event that:

- There is a General Permit violation.
- There is a reduction or increase in total disturbed acreage (General Permit Section II Part C).
- BMPs do not meet the objectives of reducing or eliminating pollutants in stormwater discharges.

Additionally, the SWPPP shall be amended when:

- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- When there is a change in the project duration that changes the project's risk level; or

- When deemed necessary by the Qualified SWPPP Developer (QSD). The QSD has determined that the changes listed in Table 1-1 can be field determined by the Qualified Stormwater Practitioner (QSP). All other changes shall be made by the QSD as formal amendments to the SWPPP.
- The following items shall be included in each amendment:
  - The person who requested the amendment;
  - The location of proposed change;
  - The reason for change;
  - The original BMP proposed, if any; and
  - The new BMP proposed.

Each amendment shall be logged at the front of the SWPPP and certification kept in Appendix D. The SWPPP text shall be revised replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Table 1-1: List of Changes to be Field Determined

Candidate changes for field location or determination by QSP(1)	**Check changes that can be field located or field determined by QSP**
Increase quantity of an Erosion or Sediment Control Measure	✓
Relocate/Add stockpiles or stored materials	✓
Relocate or add toilets	✓
Relocate vehicle storage and/or fueling locations	✓
Relocate areas for waste storage	✓
Relocate water storage and/or water transfer location	✓
Changes to access points (entrance/exits)	
Change type of Erosion or Sediment Control Measure	✓
Changes to location of erosion or sediment control	✓
Minor changes to schedule or phases	
Changes in construction materials	
(1) Any field changes not identified for field location or field determination by QSP must be approved by QSD	

1.5 Retention of Records

Paper or electronic records of documents required by this SWPPP shall be retained for a minimum of three years from the date generated or date submitted, whichever is later, for the following items:

- Site Inspections
- Annual Reports
- Discharge Reports
- Approved SWPPP documents and amendments

These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

1.6 Required Non-Compliance Reporting

If a General Permit discharge violation occurs the QSP shall immediately notify the LRP. The LRP shall include information on the violation with the Construction Annual Report. Corrective measures will be implemented immediately following identification of the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions must be documented and include the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

1.7 Annual Report

The General Permit requires that permittees prepare, certify, and electronically submit a Construction Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed in SMARTS and in accordance with information required by the on-line forms.

1.8 Changes to Permit Coverage

The General Permit allows for the reduction or increase of 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 purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is to be sought. The SWPPP shall be modified appropriately, shall be logged at the front of the SWPPP and cetrification of SWPPP amendments are to be kept in Appendix D. Updated PRDs submitted electronically via SMARTS can be found in Appendix E.

1.9 Notice of Termination

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

2.0 PROJECT INFORMATION

2.1 Project and Site Description

2.1.1 Site Description

This demolition project consists of approximately 28 acres that will be disturbed within the greater EPS site located in San Diego County at Township 12 South, Range 4 West, Section 7. The Site's location is depicted on U.S. Geological Survey (USGS) San Luis Rey Quadrangle Map as shown in Figure 1. EPS is situated adjacent to the beach and shoreline of the Pacific Ocean. EPS is bounded by the San Diego Gas & Electric (SDG&E) maintenance yard to the south, the West Inn & Suites to the southeast; the Pacific Ocean and Carlsbad Boulevard to the west; Interstate 5 to the east; and the Agua Hedionda Lagoon to the north. The Site location is identified on Figure 1 in Appendix B.

2.2 Existing Conditions

As of the initial date of this SWPPP, the Site is a developed and non-operational natural gas-fired electricity generating facility that consists of steam turbines, generators, turbine lube oil and control systems, boiler and condenser systems, air pollution control equipment, balance of plant electrical systems and transformers, and other supporting equipment (Figure 2). Based upon publicly available data, no historical cases of soil and or groundwater contamination is present at the Site.

2.2.1 Existing Drainage

Generally, industrial areas are paved with asphalt or concrete or consist of gravel covered compacted ground, and non-industrial areas are landscaped. The construction boundaries are defined by a single basin, which consists of a system of paved surface gradients, swales, catch basins, sumps, and ditches that discharges through a 96-inch concrete pipe which drains through Outfall 002 into the Agua Hedionda Lagoon (Figure 3). There is no anticipated discharge to either a MS4 or any general sheet flow offsite from areas exposed to construction activities. Depth to groundwater varies due to tidal influence, generally between approximately 14 feet below mean sea level (msl) to approximately 10 feet above msl.

The Agua Hedionda Lagoon is not listed for water quality impairment on the most recent 303(d)-list. The Agua Hedionda Creek discharges into the Agua Hedionda Lagoon and is a 303(d)-listed waterbody. The 303(d) list impairments for the Agua Hedionda Creek is identified as total dissolved solids (TDS).

2.2.2 Wetlands

The Agua Hedionda Lagoon is classified as an estuary. Contractors shall not enter these areas with vehicles or construction equipment nor place fill material into these wetlands under any circumstances.

2.2.3 Geology, Soils, and Groundwater

According to publicly available reports summarizing soil and groundwater assessment activities completed in the immediate area of the Site, soils encountered consist of sand, silty sand, sandy gravel, and sandstone to the total depths of assessment activities (approximately 45 feet bgs). According to the U.S. Department of Agriculture, Natural Resources Conservation Service Soil Survey of San Diego County, CA, one soil type was found in the EPS footprint. The soil type is detailed in Table 2-1 below. The erosion factor K signifies how susceptible a soil is to sheet and rill erosion by water. The larger the K value, the more susceptible the soil is to erosion. The upper horizons of the soil within the site footprint have a moderately high to high susceptibility to erosion by water, with erosion K factors between 0.57 and 1.98.

Table 2-1: Soils Within EPS Project Site

Soil Type	Map Symbol	Soil Description	Erosion K Factor (Ksat)	Hydrologic Soil Group
Marina loamy coarse sand	MIC	Sandy loam: Terrace, thick surface, 0-2% slopes	0.2	B

Source: U.S. Department of Agriculture, Natural Resources Conservation Service *Web Soil Survey*. Accessed May 16, 2019, at https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Depth to groundwater varies due to tidal influence, generally between approximately 14 feet below msl to approximately 10 feet above msl. The groundwater gradient is generally toward the north toward the Agua Hedionda Lagoon.

2.3 Project Description

Construction activities at the EPS facility include demolition of several structures of the facility including the turbine halls, boilers, maintenance shop, fuel oil room, control houses, stack, and water treatment facility and associated tanks. Certain portions of the EPS facility owned or operated by San Diego Gas and Electric (SDG&E) and Poseidon Water (Poseidon) will remain as currently constructed. Rubblized concrete from above-ground sections of the existing structures will be used to fill the below-ground and basement volume of the facility to grade. The footprints of demolished structures will be completed to surface with road grade gravel.

Soil and construction materials will be temporarily stockpiled on-site, if required, at a designated stockpile area located within the northern section of EPS.

2.3.1 Developed Condition

Post construction surface drainage will be directed to the south as surface flow. Surface discharge will be conveyed through the Site's existing storm water sewer systems (96-inch concrete pipe and ancillary structures) ultimately discharging into Agua Hedionda Lagoon. Post construction drainage patterns and conveyance systems are presented in Appendix B.

2.4 Permits and Governing Documents

In addition to the General Permit, the following laws, ordinances, regulations, and documents have been considered while preparing this SWPPP:

- California Title 24-2016 California Green Building Code with 2017 Errata
- Contract Documents
- Federal Endangered Species Act
- National Historic Preservation Act/Requirements of the State Historic Preservation Office
- State of California Endangered Species Act
- Clean Water Act Section 401 Water Quality Certifications and 404 Permits
- CA Department of Fish and Game 1600 Streambed Alteration Agreement

2.4.1 Federal Endangered Species Act

A desktop review for endangered species was accomplished using the U.S. Fish & Wildlife Service Information for Planning and Consultation (IPaC) webpage: https://ecos.fws.gov/ipac (accessed 2019-05-18). Based on this review, no critical habitats for potentially endangered species are located at the Site.

2.4.2 National Historic Preservation Act-Cultural Resources

All natural and cultural resources at the Site are to be protected and preserved. If there is a reasonable suspicion of a discovery of any item or area of historical or archeological interest not specifically identified in the contract documents during this construction project, the Contractor will stop all work, leave the area undisturbed and notify the NRG Environmental Manager immediately.

A desktop review for registered national historic places was accomplished using the National Park Service U.S. Department of the Interior National Register of Historic Place webpage: https://www.nps.gov/subjects/nationalregister/index.htm (accessed 2019-05-18). No registered historic places are located at the Site.

2.5 Stormwater Run-on from Offsite Areas

There is potential for offsite run on to the Site from multiple locations (Figure 2). Run on from the adjacent Carlsbad Desalination Plant is anticipated to be limited by the facility's storm water retention basin(s) and will additionally comingle with storm water from the EPS Site in the 96-inch pipe prior to discharging into the Agua Hedionda Lagoon. Run on from Avenida Encinas Street to the south occurs through the Cannon Gate (Gate 3) then flows north along a vegetated earthen ditch prior to entering the EPS Site. Flow from the ditch comingles with storm water from the EPS Site prior to discharging into the Agua Hedionda Lagoon. Run on from Cannon Street occurs from an underground pipe that flows into the Central Drainage Channel where the run on comingles with storm water from the EPS Site prior to discharging into the Agua Hedionda Lagoon. Run on from the SDG&E facility occurs along the street curb that ends in a culvert couth of the Cannon Gate. The run on flows into a vegetated earthen ditch and onto the EPS Site where it comingles with the run on from Avenida Encinas Street, and into the Central Drainage Channel where it comingles with storm water from the EPS Site prior to discharging into the Agua Hedionda Lagoon.

The General Permit requires that temporary BMPs be implemented to direct offsite run-on away from disturbed areas through the use of runoff controls.

2.6 Construction Site Sediment and Receiving Water Risk Determination

A construction site risk assessment has been performed for the project and the resultant risk level is **Risk Level 2**.

The risk level is based on project duration, location, and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

Table 2-2 and Table 2-3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors. The project sediment risk was determined through the use of the Sediment Risk Factor Worksheet using the assumptions shown in Table 2-2.

Because the site sediment risk was calculated to be Medium and the receiving water risk is conservatively considered to be High, this project has been designated **Risk Level 2**.

Table 2-2: Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value	
R	75.06	NPDES Rainfall Erosivity Factor Calc. for Small Construction Sites (EPA).	
K	0.20	State Water Board RUSLE K_Factor_GIS	
LS	1.69	State Water Board RUSLE K_Factor_GIS	
Total Predicted Sediment Loss (tons/acre)			**25.33198**
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre			☐ **Low** ☒ **Medium** ☐ **High**

Table 2-3: Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant(1)	TMDL for Sediment Related Pollutant(1)	Beneficial Uses of COLD, SPAWN, and MIGRATORY(1)
Agua Hedionda Lagoon	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No(2)
Overall Receiving Water Risk			☐ **Low** ☒ **High(3)**

Notes:
(1) If yes is selected for any option, the Receiving Water Risk is High.
(2) According to the Basin Plan for Region 9 (San Diego), the Agua Hedionda Lagoon has the SPAWN and MIGRATORY beneficial uses, but not COLD.
(3) Based on the three boxes above checked "No," the Agua Hedionda Lagoon does not meet the requirements of a sediment-sensitive water body as defined in the Construction General Permit, Section J. However, on the SWRCB's GIS-based map of High-Risk Watersheds, the point at which stormwater discharges from the site into the lagoon is mapped as being within a high-risk watershed. Therefore, as a conservative measure, the Overall Receiving Water Risk has been designated as High.

Risk Level 2 sites are subject to both the narrative effluent standards and numeric action levels (NALs). The narrative effluent standards require stormwater discharges associated with construction activity to minimize or prevent pollutants in stormwater and authorized non-stormwater through the use of controls, structures and best management practices. Discharges from Risk Level 2 site are subject to NALs for pH and turbidity shown in Table 2-4. This SWPPP has been prepared to address Risk Level 2 requirements (General Permit-Attachment C).

Table 2-4: Numeric Action Levels

Parameter	Units	Numeric Action Level Daily Averages
pH	Standard Units	Lower NAL: 6.5 Upper NAL: 8.5
Turbidity	NTU	NTU: 250

NTU: Nephelometric Turbidity Unit

2.7 Construction Schedule

The Site's sediment risk was determined based on construction taking place between July 1, 2019 and December 31, 2021. Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during construction to address potential impact to the SWPPP. The estimated schedule for planned work can be found in Appendix F.

Land disturbing activities (resulting in exposure of soil) during the EPS demolition project are expected to be minimal. Land disturbance will be limited to areas that require grading to achieve design specifications.

2.8 Potential Construction Activity and Pollutant Sources

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to stormwater runoff.

The anticipated activities and associated pollutants were used in Section 3 to select the BMPs for the EPS Demolition Project. Location of anticipated pollutants and associated BMPs are shown on Figure 3 in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 7.7.1. For a full and complete list of potential onsite pollutants, refer to the Safety Data Sheets (SDSs), which are retained onsite.

2.9 Site Access-Vehicle Use

The Contractor and support subcontractors (e.g. material delivery, sanitary service etc.) will always operate vehicles on existing and designated roadways only while onsite. The Contractor will not operate any vehicle or construction equipment on any area outside of the work zone without express written permission

from NRG. No off-road vehicle usage or construction activities are associated with this EPS Demolition project.

2.10 Dewatering

Although groundwater infiltration into excavations or other areas of disturbed soil is not anticipated during construction, dewatering activities may be required for groundwater and or stormwaters that are contained on the Site resulting from a rain event. Contained waters include water that is detained by containment berms, secondary containment structures, contained in excavations and or foundation footings as a result of direct rain or surface water runoff. Contained stormwater may be discharged, when practicable, to the existing storm water sewer system.

2.10.1 Dewatering Plan

It is anticipated that stormwater may accumulate in certain areas of the Site during construction activities. Subsections 2.10.1.1 through 2.10.1.3 describe the procedures for dewatering in the EPS Demolition Project area.

2.10.1.1 Discharges to the Encina Power Station Storm Sewer System

The EPS Demolition Project is connected to a storm water sewer system that is comingled with sump water pumped from the sub-grade areas of the power plant building. Contained stormwater that contains a sheen, odor or discoloration indicating the presence of contaminates is not to be discharged to a permeable area. Potentially impacted contained water must be transferred to a separate container (e.g., weir type above ground storage tank [AST]) and profiled for the presence of contaminates.

Waste profile analytical results received through a certified analytical report generated by a laboratory that is Environmental Laboratory Accredited Program (ELAP) certified will be provided to the NRG Environmental Manager.

Dependent of the analytical results, the contained stormwater may be either discharged to a pre-approved permeable area or disposed offsite at a licensed disposal facility under United States Department of Transportation (DOT) non-hazardous waste manifest protocols and documentation.

Storm water discharges to a pre-approved permeable area at EPS are permitted as follows:

1) The discharge is compliant with:
    a) California General Permit;
    b) San Diego Basin Objectives;

2) The discharge is:
   a) Uncontaminated contained stormwater only;
   b) Has been visually observed for the presence of:
   c) Sheen, odor, and or discoloration that may indicate the presence of contaminates.
3) If no sheen, odor, or discoloration is observed and reported on a field log, the contained stormwater may be discharged to the onsite storm drains.
4) During the dry season (June 1 to October 15), discharges may be prohibited in certain permeable areas.

2.10.1.2 Onsite Treatment of Contained Waters

Treatment of hazardous waste is not permitted onsite. The presence of hazardous waste is not anticipated to be encountered or generated during EPS Demolition Project that may impact stormwater quality. If potentially contaminated (e.g. sheen observed) contained stormwater accumulates to a volume that required bulk storage (excess of standard 20,000-gallons AST), the contractor may deploy carbon filtration providing that the treatment method is approved by NRG.

2.10.1.3 Offsite Disposal

If offsite disposal of contained storm water is required, off-haul will be coordinating with the NRG Environmental Manager. The Contractor shall not dispose of contained stormwater by either discharge, or transportation offsite without the approval of the NRG Environmental Manager.

Notification to the NRG Environmental Manager shall be made a minimum 72 hours in advance; all corresponding documentation (e.g. certified analytical report, waste profile analysis, destination location acceptance criteria, etc.) will be prepared ahead of the review request. All manifests shall be signed by an approved signatory from NRG (i.e. Plant Manager) who has the authority to sign the manifest on behalf of the Generator: NRG.

2.11 Identification of Non-Stormwater Discharges

Non-stormwater discharges to the storm sewer or surface waters are prohibited if the water contains a sheen, odor or discoloration indicate the presence of contaminants, or comes from an area of known soil or groundwater contamination. Contaminated non-storm water must be containerized and disposed of as wastewater in accordance with the ACECP Construction Waste Management Plan (CWMP).

Non-stormwater discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-stormwater discharges that do not cause erosion or carry other pollutants. Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP or authorized under a separate NPDES permit,

are prohibited. Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or stormwater runoff, are also prohibited.

Non-stormwater discharges that are authorized from this EPS Demolition Project include the following:

- None

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated onsite.

The following discharge(s) have been authorized by (a) regional NPDES permit(s):

- None

2.12 Required Site Map Information

The EPS Demolition Project Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2-4 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2-4: Required Map Information

Included on Map/Plan Sheet No. (1)	Required Element
Figure 1	The project's surrounding area (vicinity)
Figure 2	Site layout
Figure 2	Construction site boundaries
Figure 3	Drainage areas
Figure 3	Discharge locations
Figure 3	Sampling locations
Figure 2	Areas of soil disturbance (temporary or permanent)
Figure 2	Active areas of soil disturbance (cut or fill)
Figure 3	Locations of runoff BMPs
Figure 3	Locations of erosion control BMPs
Figure 3	Locations of sediment control BMPs
NA	ATS location (if applicable)
Figure 2	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed

Included on Map/Plan Sheet No. (1)	Required Element
Figure 3	Locations of all post construction BMPs
TBD	Waste storage areas
TBD	Vehicle storage areas
Figure 2	Material storage areas
Figure 2	Entrance and Exits
TBD	Fueling Locations

Notes: (1) Indicate maps or drawings that information is included on (e.g., Vicinity Map, Site Map, Drainage Plans, Grading Plans, Progress Maps, etc.)

3.0 BEST MANAGMENT PRACTICES

3.1 Schedule for BMP Implementation

Prior to any earth moving construction activities commencing, stabilized construction entrances/exits will be established at both the EPS Demolition Project site and the offsite contractor laydown yard. Existing storm sewer catch basins will be protected prior to building and pavement demolition. Sanitary facilities will be established onsite prior to construction activities commencing. Perimeter controls will be established at the laydown yard prior to any rock and/or sediment stockpiling. These BMPs shall be maintained throughout the entirety of the EPS Demolition Project.

Table 3-1: BMP Implementation Schedule

	BMP	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of Project
	EC-2, Preservation of Existing Vegetation	Start of Construction	Entirety of Project
	EC-7, Geotextiles and Mats	As Needed	Entirety of Project
	WE-1, Wind Erosion Control	Start of Construction	Entirety of Project
	WM-9, Sanitary/Septic Waste	Start of Construction	Entirety of Project
Sediment Control	SE-1, Silt Fence	Start of Construction	Entirety of Project
	SE-5, Straw Wattles/Fiber Rolls	Start of Construction	Entirety of Project
	SE-6, Gravel Bag Berm	During Construction	Entirety of Project
	SE-7, Street Sweeping & Vacuuming	On Call-As Needed	Entirety of Project
	SE-10, Storm Drain Inlet Protection	Start of Construction	Entirety of Project
	TC-1, Stabilized Construction Entrance	Prior to Construction	Entirety of Project
Tracking Control	TC-1, Stabilized Construction Entrance	Prior to Construction	Entirety of Project
	SE-7, Street Sweeping & Vacuuming	During Construction	Entirety of Project
Wind Erosion	WE-1, Silt Fencing	Prior to Construction	Entirety of Project
	WM-3, Stockpile Management	Prior to Stockpiling	Entirety of Project
	WM-8, Concrete Waste Management	During all Pavement Demolition	Entirety of Project

Any soil stockpiles generated will be placed on plastic sheeting, if any potentially contaminated soil is encountered the impacted soils will be stockpiled separately from other soils and covered immediately; pending waste profiling and disposal.

Sediment track-out will be monitored daily during construction activities. Track-out is mostly to occur during subsurface utility demolition and replacement. The Contractor will have a street sweeping company contracted on an on-call basis in the event that sediment track-out is observed on Carlsbad Blvd. or Cannon Rd. from the Gate 2 or Gate 3 entrances.

Dust control measures are to be implemented during all building and pavement demolition activities to prevent fine particles (typically cement) leaving the work areas and reducing the potential for airborne plumes migrating off-site.

3.2 Erosion and Sediment Control

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in stormwater discharges and authorized non-stormwater discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

- Preserve or replace existing vegetation where required and when feasible.
- The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
- Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
- Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
- Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

Table 3-2: Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-3	Hydraulic Mulch	✓[2]		✓	Non-Applicable
EC-4	Hydroseed	✓[2]		✓	Non-Applicable
EC-5	Soil Binders	✓[2]		✓	Non-Applicable
EC-6	Straw Mulch	✓[2]		✓	Non-Applicable
EC-7	Geotextiles and Mats	✓[2]	✓		
EC-8	Wood Mulching	✓[2]		✓	Non-Applicable
EC-9	Earth Dike and Drainage Swales	✓[3]		✓	Non-Applicable
EC-10	Velocity Dissipation Devices			✓	Non-Applicable
EC-11	Slope Drains			✓	Non-Applicable
EC-12	Stream Bank Stabilization			✓	Non-Applicable
EC-14	Compost Blankets	✓[2]		✓	Non-Applicable
EC-15	Soil Preparation-Roughening			✓	Non-Applicable
EC-16	Non-Vegetated Stabilization	✓[2]		✓	Non-Applicable
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
[3] Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

Table 3-2 indicates the BMPs that shall be implemented to control erosion on the construction site. CASQA Fact Sheets for temporary erosion control BMPs are provided in Appendix H. These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Scheduling: EC-1

Contractor shall reduce the discharge of pollutants to storm drain facilities or water courses caused by construction activities by scheduling said activities in a manner that will limit exposure of disturbed soil to wind, rain, and storm water run-on and run-off. Specifically, the following activities shall not occur within 48 hours of a forecast rain event of 50% or greater:

- Site grading (not including filling of the power plant tunnels and foundation voids)
- Installation/pouring of new plain cement concrete (PCC)

Preservation of Existing Vegetation: EC-2

Contractor shall apply preservation of existing vegetation to the extent practicable and feasible at the Site; vegetation that is removed will be replaced as soon as feasible. The Contractor shall implement BMP EC-2 where applicable.

Geotextiles & Mats: EC-7

Contractor shall implement one or more of these measures to stabilize disturbed soil areas (stockpiles, slopes, embankments, conveyances, etc.) and protect these soils from erosion by rain, wind or storm water run-on and run-off when not actively being used during a work phase. For short-term applications, plastic sheeting (or a suitable alternative) will be used to cover stockpiles prior to a forecast rain or wind event. Stockpiles that will be exposed and idle for longer periods (> 14 days of inactivity) shall be protected by use of hydraulic mulch or RECP Blankets (jute or coconut mesh) while not actively being used during a work phase. This includes stockpiles and maintenance yard materials. All protective coverings shall be secured to the material being covered with sandbags or other means to ensure the covering is not removed by wind or storm events.

Wind Erosion Control: WE-1

Contractor shall apply water to actively disturbed soil areas to prevent wind-blown soil or debris from leaving the active work site or laydown and stockpile areas. During windy conditions (forecast or actual wind conditions of approximately 25 mph or greater), dust control will be applied to disturbed soil areas to adequately control wind erosion.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment

controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

Table 3-3 indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H.

These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Table 3-3: Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓(2) (3)	✓		
SE-2	Sediment Basin			✓	Not Applicable
SE-3	Sediment Trap			✓	Not Applicable
SE-4	Check Dams			✓	Non-Applicable
SE-5	Fiber Rolls	✓(2)(3)	✓		
SE-6	Gravel Bag Berm	✓(3)	✓		
SE-7	Street Sweeping	✓	✓		As Needed
SE-8	Sandbag Barrier		✓		As Needed
SE-9	Straw Bale Barrier		✓		As Needed
SE-10	Storm Drain Inlet Protection	✓ RL2&3	✓		
SE-11	Active Treatment System (ATS)			✓	Non-Applicable
SE-12	Manufactured Linear Sediment Controls		✓		
SE-13	Compost Sock and Berm	✓(3)	✓		As Needed
SE-14	Biofilter Bags	✓(3)		✓	Non-Applicable
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-2	Stabilized Construction Roadway		✓		
TC-3	Entrance Outlet Tire Wash			✓	Non-Applicable
Alternate BMPs Used:					**If used, state reason:**

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP used		If not used, state reason
			YES	NO	
(1) Applicability to a specific project shall be determined by the QSD (2) The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements (3) Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope					

The installation of linear barriers will serve as sediment control for exposed soil areas and material stockpiles. Linear barriers shall be maintained to provide adequate sediment holding capacity. Fiber rolls shall be placed, trenched in and staked following manufacturer's recommendations and changed out depending on local conditions. Fiber rolls with monofilament plastic shall not be used on EPS Demolition Project. Fiber rolls with a natural fiber wrap shall be utilized instead. Sediment from all linear barriers shall be removed when it reaches approximately 1/3 of the barrier height.

Silt Fence: SE-1

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 coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence. This BMP will be utilized at the project site.

Fiber Rolls: SE-5

Linear barriers for sediment control protection will be applied throughout the active construction zone during each of the two phases of construction. Linear BMPs will be applied primarily at the perimeter of the active construction area and or at the toes of soil stockpiles.

Fiber rolls will be used for each of the phases of construction individually and not for the entire construction area and laydown yard (as shown in the Storm Water Erosion Control Plan). In each phase of construction, concrete and soil will be excavated from the active phase of construction, producing a depression in the central portion of the EPS Demolition Project site, which should prevent runoff during storm events from leaving the construction area.

Gravel Bag Berm: SE-6

Gravel bag berms are to be used instead of sandbags when construction activities encroach upon the AOA. Gravel bags will be replaced when signs of wear and tear of the gravel bags may pose a FOD danger.

Street Sweeping: SE-7

The Contractor will implement sediment sweeping and vacuuming, as necessary, to control sediment that is tracked from the EPS Demolition Project site onto public or private roads. This will limit the amount of sediment that may be transported to storm drains or watercourses.

The Contractor shall have a street sweeper onsite or contract with a street sweeping company on an on-call basis if street sweeping is deemed necessary.

Sandbag Barrier: SE-8

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.

Straw Bale Barrier: SE-9

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.

Storm Drain Inlet Protection: SE-10

Any inlets within the existing work area or immediately outside of the work area that are at risk of receiving sediment from the work area will be protected, as necessary, from sediment using a fiber roll barrier anchored down by gravel bags. The area behind the fiber roll barrier will collect and hold runoff in order to allow suspended sediment to settle out. The Contractor will remove this sediment periodically during the rainy season, and especially after heavy rains. Fiber rolls that become clogged with sediment will be replaced as necessary to ensure the free flow of water. Care should be taken as not to create a flooding condition. The geotextile fabric shall be removed prior to or during rain events if the geotextile barrier creates a flooding condition.

Inlets will also need to be protected from any grinding, sandblasting, and demolition operations. Any air-borne debris from these operations can settle into any surrounding inlets. Therefore, these inlets need to be completely covered with bags or with a plastic medium. This blockage must be removed at the end of the working shift each day.

Manufactured Linear Sediment Controls: SE-12

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. They 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).

Compost Socks and Berms: SE-13

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.

Stabilized Construction Entrance and Exit: TC-1

The entrance/exit location with the Laydown Yard Area will be stabilized to reduce tracking of sediment as a result of construction traffic. Any additional locations where construction traffic travels from soil to pavement shall also be protected. Entrances will be designated and graded to prevent runoff from leaving the site. Stabilization material will be 3- to 6-inch crushed aggregate and/or manufactured "bump" plate. The entrance will be flared where it meets the existing road to provide an adequate turning radius.

Construction vehicles shall be inspected for any excessive sediment prior to exiting the work area. If excessive sediment is identified the sediment shall be manually removed with hand tools. Sweep and remove sediment as necessary from the corrugated steel plates and airfield/exit side.

Stabilized Construction Roadway: TC-2

Areas that are graded for construction traffic, or pavement replacement, and parking purposes are susceptible to erosion and dust. The Contractor will provide efficient construction road stabilization during the phased roadway demolition and replacement during the entirety of the construction project.

3.3 Non-Stormwater Controls- Waste and Materials Management

Non-stormwater discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-stormwater discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-stormwater BMPs is based on the list of construction activities with a potential for non-stormwater discharges identified in Section 2.11 of this SWPPP.

Table 3-4 indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-stormwater control BMPs are provided in Appendix H.

Non-stormwater BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, Sheet CG501will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details on Sheet CG501 prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Table 3-4: Temporary Non-Stormwater BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP Used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operation		✓		
NS-3	Paving and Grinding Operation		✓		
NS-4	Temporary Stream Crossing			✓	Non-Applicable
NS-5	Clear Water Diversion			✓	Non-Applicable
NS-6	Illicit Connection/Discharge	✓	✓		
NS-7	Potable Water/Irrigation			✓	Non-Applicable
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operation			✓	Non-Applicable
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
NS-14	Material and Equipment Use Over Water			✓	Non-Applicable
NS-15	Demolition Removal Adjacent to Water			✓	Non-Applicable
NS-16	Temporary Batch Plants			✓	Non-Applicable
Alternate BMPs Used:			**If used, state reason:**		
[1] Applicability to a specific project shall be determined by the QSD					

Water Conservation Practices: NS-1

The Contractor shall implement water conservation practices when water is used on the construction site. Irrigation areas shall be inspected, and watering schedules shall be adjusted to prevent erosion, excess watering, or runoff. The Contractor shall shut off the water source to broken lines, sprinklers, or valves and they shall be repaired as soon as possible. When possible, water from waterline flushing shall be reused for landscape irrigation. Paved areas shall be swept and vacuumed, not washed with water.

Construction water runoff, including water from water line repair, shall be directed to areas to infiltrate into the ground and shall not be allowed to enter storm drain systems or watercourses. Spilled water shall not be allowed to escape water truck filling areas. When possible, the Contractor shall direct water from offsite sources around the construction site or shall minimize contact with the construction site.

Dewatering Operation: NS-2

Dewatering operations may be necessary at certain times during the course of the project. These will be conducted in accordance with *BMP NS-2, Dewatering Operations*, and as described in Section 2.10.

Paving and Grinding Operation: NS-3

The Contractor will implement the BMP listed above during including any asphalt or portland cement concrete (PCC) saw-cutting operations. Paving operations shall not occur 48 hours prior to or during a 50% forecasted rain event.

The EPS Demolition Project will require saw-cutting operations periodically throughout the project; BMP *WM-8, Concrete Waste Management*, will be implemented to contain and dispose of saw-cutting slurries. Sandbags will be used as required should vacuuming not be sufficient to contain the slurry and prevent discharges to any storm drain system as required, should vacuuming not be sufficient. The slurry will be vacuumed and discharged to the concrete washout facility described below. Dried and cured concrete wastes will be disposed offsite during concrete washout maintenance activities.

Illicit Connection/Discharge: NS-6

The Contractor will implement *BMP NS-6, Illicit Connection/Discharge* throughout the duration of the EPS Demolition Project. Accidental discharges will be cleaned up immediately. Illicit discharges by the Contractor's operation will not be allowed. Illicit discharges by others will be reported to the appropriate authorities (*i.e.,* the local city authority).

Vehicle and Equipment Cleaning: NS-8

Vehicle and equipment cleaning is not to be performed on the EPS Demolition Project site.

Vehicle and Equipment Maintenance & Fueling: NS-9/NS-10

Several types of vehicles and equipment will be used onsite throughout the EPS Demolition Project, including loaders, trucks and trailers, backhoes, forklifts, generators, compressors, and traffic control equipment. *BMPs NS-9, Vehicle and Equipment Fueling,* and *NS-10, Vehicle and Equipment Maintenance* will be utilized to prevent discharges of fuel and other vehicle fluids. Except for concrete washout, vehicle cleaning is not scheduled to be performed onsite.

The Contractors may plan to place a fuel tank onsite. Any fuel storage container with greater than a five-gallon storage capacity shall be considered a fuel tank. The fuel tank must be paced in a pitted, bermed, and plastic lined area with all fueling operations conducted at least 20 feet away from operational inlets and drainage facilities and on a level graded area.

Contractor supplied fuel storage tanks will not be deployed at the EPS Demolition Project site. Fueling construction equipment will be conducted by a contractor owned and operated mobile fueling vehicle, a mobile fueling contractor, or from truck bed tanks. Personal vehicles (i.e. pickups, automobiles, delivery vehicles etc.), shall not be fueled onsite; only construction equipment (e.g. excavators, backhoes, generator etc.) will be fueled on the EPS Demolition Project site.

- All refueling activities must be monitored continuously and, in a manner, to prevent spills and or overfills.

If an AST is deployed to the EPS Demolition Project, the following requirements must be met:

- Daily visual inspections,
- Proper labeling,
- Secondary containment, proper grounding,
- AST refilling must be monitored continuously and, in a manner, to prevent spills and or overfills.

Concrete Curing & Finishing: NS-12/NS-13

The Contractor will utilize these BMPs in the curing and finishing of concrete surfaces. Concrete cure shall be stored in a covered and contained condition, ideally inside of a large storage container. Leaks or spills of concrete cure which are not completely cleaned and removed could result in the necessity of sampling of discharges during the next rain events.

3.3.1 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into stormwater discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into stormwater discharges. If applicable to the project site, waste management should be conducted in accordance with the EPS CWM.

Materials and waste management pollution control BMPs shall be implemented to minimize stormwater contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged offsite. The primary mechanisms for stormwater contact that shall be addressed include:

- Direct contact with precipitation
- Contact with stormwater run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into stormwater.

Table 3-5: Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement(1)	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Prevention and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓	✓		
WM-07	Contaminated Soil Management		✓		
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management			✓	Non-Applicable
Alternate BMPs Used:				**If used, state reason:**	
(1) Applicability to a specific project shall be determined by the QSD.					

A list of construction activities is provided in Section 2.8. Table 3-5 indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Material management BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H. If there is a conflict between documents, the Site Map will prevail over narrative in the body of the SWPPP or guidance in the BMP Fact Sheets. Site specific details in the Site Map prevail over standard details included in the Site Map. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Material Delivery, Storage, and Use: WM-1/WM-2

The Contractor will utilize this BMP for construction material loading, unloading, and short-term storage. The Contractor will utilize stabilized areas, as necessary, to prevent potential spills or unnecessary tracking of sediment. The Contractor will utilize this BMP for construction material loading, unloading, and storage areas.

In general, BMPs WM-1 and WM-2 will be implemented to help prevent discharges of construction materials during delivery, storage, and use. The general material storage area will be located in the laydown yard; it is anticipated that building materials will be staged onsite immediately prior to installation.

Stockpile Management: WM-3

Soils or concrete debris stockpiles are expected for this EPS Demolition Project. Stockpiles shall be covered with the appropriate mats or stockpile blankets. The use of plastic is acceptable; however, the Contractor shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the Contractor shall consider the use of plastic materials resistant to solar degradation. Stockpiles shall be covered prior to a forecast storm or if stockpiles become inactive. Stockpile covers shall be weighted with sandbags or gravel bags and keyed in as required. Refer the CASQA Handbook for details on stockpile management, depending on the materials to be stored. Contaminated soils removed from the active construction area and stored at the Contaminated Soils Stockpile area (see Attachment 2) shall be managed in accordance with the EPS CWM which shall be kept on site with the SWPPP for the duration of the EPS Demolition Project.

Spill Prevention and Control: WM-4

The Contractor shall implement this BMP when any chemical and/or hazardous substance is used or stored on site to control, clean-up and prevent spills and discharges to storm drain systems. Spills of oil, petroleum products, substances listed under 40 Code of Federal Regulations (CFR) parts 11, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately. Spill prevention is also discussed above in Material Delivery, Storage, and below in the following waste management and equipment maintenance sections.

A copy of the EPS Environmental Protection Plan[2] (EPP) be kept onsite with the SWPPP for the duration of the EPS Demolition Project and referred to as needed as described above.

Whenever a pollutant discharge of any kind occurs on the construction site, in addition to taking proper spill containment actions, the contractor shall contact the NRG Environmental Manager. In the event a spill enters, or has the potential to enter a storm drain, contact water, or enter a drain (sanitary or sewer), the contractor shall contact the NRG Environmental Manager. Detailed spill logs will be kept and provided to the NRG Environmental Manager.

Solid Waste Management/Hazardous Waste Management: WM-5/WM-6

[2] [REFERENCE]

The Contractor shall implement this BMP whenever wastes are generated, stockpiled, or removed from the site. Implementation of this BMP minimizes or eliminates the discharge of pollutants to the drainage system or watercourses. Hazardous wastes are not anticipated to be generated during this EPS Demolition Project

BMP WM-5, Solid Waste Management, and *BMP WM-6, Hazardous Waste Management* will be implemented to minimize stormwater contact with waste materials and prevent waste discharges. Solid wastes will be loaded directly into trucks for offsite disposal. When onsite storage is necessary, solid wastes will be stored in watertight dumpsters in the general storage area of the Contractor's yard. Dumpster locations will be located throughout the EPS Demolition Project site. Asphalt concrete (AC) and PCC rubble will be stockpiled in the general storage area and will be surrounded with sediment controls. Solid waste, including rubble stockpiles, will be removed and disposed offsite as soon as practicable and feasible. Dumpsters must have lids and be closed during rain events.

Hazardous wastes will be stored in DOT approved shipping containers, or under cover in the designated containment area discussed above for materials storage. Hazardous wastes will be stored in appropriate and clearly marked containers and segregated from other non-waste materials.

Contaminated Soil Management: WM-7

The EPP will be followed to mitigate both contaminated and uncontaminated soils from the site; this document will be kept on site along with the SWPPP for the duration of the EPS Demolition Project. The Contractor will be responsible for excavating soil associated with the EPS Demolition Project following the procedures detailed in the EPP. Soil that is determined to be contaminated by the testing protocols described in the EPP will be hauled to the Contaminated Soils Stockpile Area as shown in Figure 2. BMPs identified in this SWPPP associated with soil excavation and stockpiling of soil will be the responsibility of the Contractor. The Contractor shall be responsible for any blown debris or dust from stockpiles and the stockpile height is restricted to 20 feet.

In the event that contaminated soil is encountered, the Contractor will immediate contact the NRG Environmental Manager, who will in turn notify the Regional Water Board, or any other local jurisdiction. Potentially contaminated, or contaminate materials, will be profiled and disposed of offsite under DOT waste manifest protocols and documentation. Only Hazardous Waste Operations and Emergency Response (HAZWOPER) certified personnel will be allowed to perform sampling and profiling.

Concrete Waste Management: WM-8

BMP WM-8, Concrete Waste Management, will be implemented in above grade portable concrete washout facilities to be constructed and maintained at concrete waste washout areas are shown on the WPCDs

(Attachment 2). All excess concrete and concrete washout slurries will be discharged to the washout facility for drying. BMP maintenance, waste disposal, and BMP removal will be conducted as described in WM-8.

Concrete trucks with recycling systems are highly encouraged and recommended for use in this this project. Recycling systems allow for the concrete truck to washout at the pouring area (or pull away to allow for a new truck in multi-pour jobs) and the washout material is recycled.

It is additionally recommended that concrete work be performed during dry weather. Weather forecasts can be found for the project area at the National Oceanic & Atmospheric Administration (NOAA) website: http://www.noaa.gov

Sanitary-Septic Waste Management: WM-9

The Contractor shall minimize or eliminate the discharge of construction sanitary/septic wastes by implementing this BMP. This BMP is applicable to temporary and portable sanitary/septic systems on construction sites and associated areas. Maintenance will be provided as necessary and wastes will be disposed offsite. The toilets will be located away from concentrated flow paths and traffic flow, as well as, anchored and contained per BMP Manual Specifications. In addition, all Risk Level 1 BMPs regarding good housekeeping measures for waste management shall be implemented as applicable.

3.4 Post Construction Stormwater Management Measures

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Stormwater Management Plan. ☐ Yes ☒ No

The following source control post construction BMPs have been identified for the site to comply with General Permit Section XIII.B and local requirements:

- None.

A plan for the post construction funding and maintenance of these BMPs has been developed to address at minimum five years following construction. The post construction BMPs that are described above shall be funded and maintained by NRG. If required, post construction funding and maintenance will be submitted with the NOT.

4.0 BMP INSPECTION – MAINTENANCE - REAP

4.1 BMP Inspection, Maintenance & Rain Event Action Plans

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP Inspection Form must be filled out for inspections and maintained onsite with the SWPPP. The Inspection Form includes the necessary information identified in Section 7.6. A blank Inspection Form can be found in Appendix I. Completed checklists shall be kept in the Construction Soil Management Plan (CSMP) Attachment 2 "Monitoring Records".

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72-hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

4.2 Rain Event Action Plan

In accordance with General Permit, Risk Level 2 sites require the implementation of a Rain Event Action Plan (REAP) which will be developed by the project QSP. A REAP will be prepared by the project QSP 48-hours in advance of a precipitation event with a 50% or greater chance of producing precipitation in the project area. The REAP will be kept onsite and will be implemented 24-hours in advance of a 50% or greater predicted rain event. Weather forecast will be obtained from the NOAA National Weather Service webpage located at: http://www.noaa.gov

The REAP is a written document designed to be used as a planning tool by the QSP to protect exposed portions of the EPS Demolition Project and to ensure that the discharger (NRG) has adequate staff, materials, and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during a rain event. It is the responsibility of the QSP to be aware of precipitation forecasts and to obtain copies of NOAA forecasts. In an effort to reduce paper waste, weather forecasts may be saved in an electronic format (i.e. *.pdf*).

This SWPPP includes a REAP template (CSMP- Attachment 2) that the QSP will customize for each 50% or greater forecast rain event at the EPS Demolition Project site. Paper copies of the REAPs will be kept

with the SWPPP onsite in accordance with the General Permit. At a minimum a REAP will include the following information:

- Site Address.
- Calculated Risk Level.
- Site Stormwater Manager information (name, company, title, 24-hour telephone number).
- Onsite erosion and sediment control manager information (name, company, title, 24-hour telephone number).
- Stormwater sampling staff information (name, company, title, 24-hours contact number).
- Activities associated with current construction.
- Trades active on the construction project.
- Trade contractor's information.

5.0 TRAINING

Appendix L identifies the QSPs for the EPS Demolition Project. To promote stormwater management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix K, which identifies the site-specific stormwater topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix K.

6.0 RESPONSIBLE PARTIES AND OPERATORS

6.1 Responsible Parties

Approved Signatory(ies) who are responsible for SWPPP implementation and have authority to sign permit-related documents are listed below. Written authorizations from the LRP for these individuals are provided in Appendix L. The Approved Signatory(ies) assigned to this project [is/are]:

Table 6-1: Responsible Parties

Name	Title	Role	Phone Number

QSPs identified for the project are identified in Appendix L. The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-stormwater and stormwater visual observations and inspections;
  - Performing non-stormwater and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-stormwater management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than stormwater are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.

- Notifying the LRP or Authorized Signatory immediately of offsite discharges or other non-compliance events.

6.2 Contractor List

Name:	TBD
Title:	
Company:	
Address:	
Phone Number:	
Number (24/7):	

Name:	TBD
Title:	
Company:	
Address:	
Phone Number:	
Number (24/7):	

7.0 CONSTRUCTION SITE MONITORING PLAN

7.1 Purpose

This Construction Site Monitoring Program was developed to address the following objectives:

1) To demonstrate that the site is in compliance with the Discharge Prohibitions of the General Permit;
2) To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
3) 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;
4) To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

7.2 Applicability of Permit Requirements

This project has been determined to be a **Risk Level 2** project. The General Permit identifies the following types of monitoring as being applicable for a **Risk Level 2** project:

- Visual inspections of BMPs;
- Visual monitoring of the site related to qualifying rain events (QRE);
- Sampling of stormwater discharge produced from a QRE of 0.5 inches of precipitation.
- A dry period of 48-hours separates QRE events.
- Visual monitoring of the site for non-stormwater discharges;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

7.3 Weather and Rain Event Tracking

Visual monitoring and inspections requirements of the General Permit are triggered by a QRE. The General Permit defines a QRE as any event that produces 0.5 inches or more of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate QREs.

For the purposes of assessing exceptions to the Receiving Water Monitoring triggers, the General Permit establishes the compliance storm event at the 5-year, 24-hour event:

- Based on the NOAA National Weather Service- Hydrometeorological Design Studies Center-Precipitation Frequency Data Server (PFDS): the 5-year, 24-hour event is 2.29 inches (Attachment 1).

7.3.1 Weather Tracking

The QSP shall ensure that a rain gauge is properly installed and maintained throughout the duration of the demolition activities. The rain gauge shall be read daily during normal site scheduled hours, at approximately the same time every day, and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 "Weather Records". Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied, and the gauge reset. Alternatively, an automated rain gauge monitoring device may be installed. If an automated device is installed, the make, model, and use of instructions shall be amended into the SWPPP.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) is located at: Carlsbad (CBDSD): https://forecast.weather.gov/MapClick.php?lat=33.1659&lon=-117.3382#.XOG8s45KiUk

7.4 Monitoring Locations

Monitoring locations will be established as construction activities commence and change with the progression of construction; monitoring locations are to be indicated on the Site Plan and amended as site conditions change. Stormwater discharge monitoring shall be conducted at locations of BMP failures or where stormwater discharges that may impact stormwater quality are observed by the QSP.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

7.5 Safety and Monitoring Exemptions

Safety practices for sample collection will be in accordance with the Site-Specific Health & Safety Plan and/or HAZWOPER protocols (if stormwater discharge is determined to be potentially hazardous).

Site security and safety requirements that apply to sampling personnel include the following:

- NRG escorting procedures

- Level D Personal Protective Equipment (PPE)

This EPS Demolition Project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site construction hours.
- Scheduled site construction hours are to be Monday through Saturday 0700-1730.

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above, then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 "Monitoring Records".

7.6 Visual Monitoring

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.

Table 7-1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of a **Risk Level 2** project of the General Permit.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted weekly to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

7.6.1.2 Non-Stormwater Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-stormwater discharges. Inspections will record:

- Presence or evidence of any non-stormwater discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

Table 7-1: Summary of Visual Monitoring & Inspections

Type of Inspection	Frequency
Routine Inspections	
BMP Inspections	Weekly[1]
BMP Inspections – Tracking Control	Daily
BMP Inspections – Housekeeping: FOD	Daily
Non-Stormwater Discharge Observations	Quarterly during daylight hours
Rain Event Triggered Inspections	
Site Inspections Prior to a Qualifying Rain Event	Within 48-hours of a qualifying rain event [2]
BMP Inspections During an Extended Storm Event	Every 24-hour period of a rain event[3]
Site Inspections Following a Qualifying Rain Event	Within 48 hours of a qualifying rain event[2]

[1] Most BMPs must be inspected weekly; those identified below must be inspected more frequently.

[2] Inspections are required during scheduled site operating hours.

[3] Inspections are required during scheduled site operating hours regardless of the amount of precipitation on any given day.

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a QRE; following a QRE, and every 24-hour period during a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours prior to a qualifying event a stormwater visual monitoring site inspection will include observations of the following locations:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly implemented;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

BMP inspections and visual monitoring will be triggered by a NOAA quantitative predicted forecast (QPF) that indicates ½-inch or more of rain will occur in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event, BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the rain event, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

7.6.2.3 Visual Observations Following a Qualifying Rain Event

Within 48-hours following a QRE (0.5 inches of rain or more) a stormwater visual monitoring site inspection is required to observe:

- Stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rainwater.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP. As inspectors are assigned to the project, their training qualifications and contact information will be placed in Appendix K.

Stormwater observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 "Example Forms"). BMP inspections shall be documented on the site-specific BMP inspection checklist. Any photographs used to document observations will be referenced on stormwater site inspection report and maintained with the Monitoring Records in Attachment 2.

The QSP shall within 2 days of the inspection submit copies of the completed inspection report to the NRG Environmental Manager. A completed copy of the reports will be kept in CSMP Attachment 2 "Monitoring Records".

7.6.4 Visual Monitoring Follow-up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72-hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 "Monitoring Records".

The QSP shall within 3 days of the inspection submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to the NRG Environmental Manager.

Results of visual monitoring must be summarized and reported in the Annual Report.

7.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 7.6.1 and 7.6.2 will be conducted at the locations identified in this section.

BMP locations are shown on the Site Maps in SWPPP Appendix A. There are 3 drainage area(s) on the project site and the contractor's yard, staging areas, and storage areas. Drainage area(s) are shown on the Site Maps in Appendix B and Table 7-2 identifies each drainage area by location.

Table 7-2: Site Drainage Areas

Location No.	Location
1	Stockpile Area
2	Construction Site: Impervious Pavements
3	Construction Site: Impervious Pavements

There are no proposed spill containment basin areas on the Site that detains stormwater onsite. Stormwater storage or containment area(s) are shown on the Site Maps in Appendix B and Table 7-3 identifies each stormwater storage or containment area by location.

Table 7-3: Stormwater Storage and Detention Areas

Location No.	Location
N/A	N/A

There is one discharge location on the project site. The stormwater discharge location is shown on Figure 3, and Table 7-4 identifies the location. If additional stormwater discharge locations are identified during the EPS Demolition Project, the QSD will amend the sampling locations into the SWPPP, and update the amendment log in Appendix D.

Table 7-4: Site Stormwater Discharge Locations

Location No.	Location
Outfall-002	Northeast of the onsite detention basin

7.7 Water Quality Sampling and Analysis

7.7.1 Sampling & Analysis Plan: Non-Visible Pollutants in Stormwater Runoff

This Sampling & Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in stormwater runoff discharges from the EPS Demolition Project site. Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The following construction materials, wastes, or activities, as identified in Section 2.8, are potential sources of non-visible pollutants to stormwater discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

- Vehicle fluids, including oil, grease, petroleum, and coolants
- Cement materials associated with concrete operations

The following existing site features, as identified in Section 2.8, are potential sources of non-visible pollutants to stormwater discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps in Appendix B.

- None

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B.

- None

The project has minimal potential to receive stormwater run-on from the following locations with the potential to contribute non-visible pollutants to stormwater discharges from the project. Locations of such run-on to the project site are shown on the Site Maps in Appendix B.

- Carlsbad Desalination Plant (Poseidon)
- Avenidas Encinas Street (City of Carlsbad)
- SDG&E Catch Basins
- Cannon Road

7.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents stormwater contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- A construction activity, including but not limited to those in Section 2.8, with the potential to contribute non-visible pollutants (1) was occurring during or within 24-hours prior to the rain event, (2) BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Stormwater runoff from an area contaminated by historical usage of the site has been observed to combine with stormwater runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

7.7.1.2 Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the Site Maps in Appendix B and include the locations identified in Tables 7-5 through 7-9.

Sampling location(s) on the project site have not yet been identified for the collection of samples of runoff from planned material and waste storage areas and areas where non-visible pollutant producing construction activities are planned.

Table 7-5: Non-Visible Pollutant Sample Locations – Material and Waste Storage Areas

Sample Location Number	**Sample Location Description**	**Sample Location Latitude and Longitude** (Decimal Degrees)
#	TBD	TBD

Sampling locations have yet to be identified for the collection of samples of runoff from drainage areas where soil amendments will be applied that have the potential to affect water quality.

Table 7-6: Non-Visible Pollutant Sample Locations – Soil Amendment Areas

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Decimal Degrees)
#	TBD	TBD

Sampling locations have yet to be identified for the collection of samples of runoff from drainage areas contaminated by historical usage of the site.

Table 7-7: Non-Visible Pollutant Sample Locations – Areas of Historical Contamination

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Decimal Degrees)
#	TBD	TBD

Sampling location(s) have yet to be identified for the collection of an uncontaminated sample of runoff as a background sample for comparison with the samples being analyzed for non-visible pollutants. This location(s) will be selected such that the sample will not have come in contact with the operations, activities, or areas identified in Section 7.7.1 or with disturbed soils areas.

Table 7-8: Non-Visible Pollutant Sample Locations – Background (Unaffected Sample)

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Decimal Degrees)
#	TBD	TBD

Sampling locations have not been identified for the collection of samples of run-on to the project site. Run-on from these locations has the potential to combine with discharges from the site being sampled for non-visible pollutants. These samples are intended to identify potential sources of non-visible pollutants that originate off the project site.

Table 7-9: Non-Visible Pollutant Sample Locations – Site Run-On

Sample Location Number	**Sample Location**	**Sample Location Latitude and Longitude** (Decimal Degrees)
#	TBD	TBD

If a stormwater visual monitoring site inspection conducted prior to or during a storm event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm drain system that is at a location not listed above and has not been identified on the Site Maps, sampling locations will be selected by the QSP using the same rationale as that used to identify planned locations. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form prior to a forecasted qualifying rain event.

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor	☐	Yes	☒	No
Consultant	☒	Yes	☐	No
Laboratory	☐	Yes	☒	No

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* and Chain-of-Custody (CoC) forms, which are provided in CSMP Attachment 3 “Example Forms”. Samples on the EPS Demolition site will be collected by a QSP under contract to:

Company Name:	Rincon Consultants
Street Address:	2215 Faraday Avenue, Suite A
City, State Zip:	Carlsbad, CA 92008
Telephone Number:	(760) 918-9444

The QSP or his/her designee will contact NRG 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins if one of the triggering conditions is identified during an inspection to ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.1.4 Analytical Constituents

Table 7-10 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7-10: Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Vehicle Batteries	Sulfate, pH, Lead	Sulfuric Acid, pH, Lead
Masonry Products	Alkalinity, pH	Alkalinity, pH
Non-pigmented Curing Compounds	pH	pH
Plumbing	Cu, Pb, Sn, Zn	Cu, Pb, Sn, Zn
Removal of Existing Structures	Zn, VOCs, PCBs	Zn, VOCs, PCBs

7.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations shown on the Site Maps in Appendix B or in the locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, or historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7-11. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples. Sample collection and handling requirements are described in Section 7.7.1.6.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7-11. Samples will be analyzed by a California state certified ELAP laboratory, as follows:

Laboratory Name:	TestAmerica Irvine
Street Address:	17461 Derian Ave., Suite 100
City, State Zip:	Irvine, CA 92614-5817

Telephone Number:	(949) 261-1022
Point of Contact:	Rossina Tomova, Project Manager
ELAP Certification Number:	CA ELAP 2706

Samples will be delivered to the laboratory by any of the following method(s):

Driven by Contractor	☒	Yes	☐	No
Picked up by Laboratory Courier	☒	Yes	☐	No
Shipped	☒	Yes	☐	No

Table 7-11 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
VOCs-Solvents	EPA 8260B	3 x 40 mL	VOA-glass	Store at 4˚ C, HCl to pH<2	1 ug/L	14 days
SVOCs	EPA 8270C	1 x 1 L	Glass-amber	Store at 4˚ C	10 ug/L	7 days
BOD	EPA 405.1	1 x 500 mL	Polypropylene	Store at 4˚ C	1 mg/L	48 hours
COD	EPA 410.4	1 x 250 mL	Glass-Amber	Store at 4˚ C, H_2SO_4 to pH<2	5 mg/L	28 days
DO	SM 4500-O G	1 x 250 mL	Glass-Amber	Store at 4˚ C	Check Lab	8 hours
pH	EPA 150.1	1 x 100 mL	Polypropylene	None	unitless	Immediate
Alkalinity	SM 2320B	1 x 250 mL	Polypropylene	Store at 4˚ C	1 mg/L	14 days
Metals: Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Na, Th, Va, Zn	EPA 6010B/7470A	1 x 250 mL	Polypropylene	Store at 4˚ C, HNO_3 to pH<2	0.1 mg/L	6 months
Metal: Chromium VI	EPA 7199	1 x 500 mL	Polypropylene	Store at 4˚ C	1 ug/L	24 hours

Table 7-11 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time

Notes:

°C	–	Degrees Celsius	µg/L	–	Micrograms per Liter
BOD	–	Biological Oxygen Demand	ml	–	Milliliter
COD	–	Chemical Oxygen Demand	PCB	–	Polychlorinated Biphenyl
DO	–	Dissolved Oxygen	SVOC	–	Semi-Volatile Organic Compound
EPA	–	Environmental Protection Agency	SM	–	Standard Method
HCl	–	Hydrogen Chloride	TPH	–	Total Petroleum Hydrocarbons
H_2SO_4	–	Hydrogen Sulfide	TRPH	–	Total Recoverable Petroleum Hydrocarbons
HNO_3	–	Nitric Acid	VOA	–	Volatile Organic Analysis
L	–	Liter	VOC	–	Volatile Organic Compound
mg/L	–	Milligrams per Liter			

7.7.1.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results and any associated run-on results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 CFR §§117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

7.7.2 Sampling & Analysis Plan for pH & Turbidity in Stormwater Runoff

Sampling and analysis of runoff for pH and turbidity is required for this **Risk Level 2** project. This Sampling & Analysis Plan describes the strategy for monitoring turbidity and pH levels of stormwater runoff

discharges from the EPS Demolition Project site and run-on that may contribute to an exceedance of a NAL, or exceedance of a Receiving Water Monitoring Trigger.

Samples for turbidity will be collected from drainage areas with disturbed soil areas and samples for pH will be collected from drainage areas with a high risk of pH altering discharge.

7.7.3 Sampling Schedule

Stormwater runoff samples shall be collected for turbidity from each day of a qualifying rain event that results in a discharge from the project site. At minimum, turbidity samples will be collected from each site discharge location draining a disturbed area. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the project each day of discharge during the qualifying event. Typically, representative samples will be spaced in time throughout the daily discharge event.

Stormwater runoff samples shall be collected for pH from each day of qualifying rain events that result in a discharge from the project site. Note that pH samples are only required to be collected during project phases and from drainage areas with a high risk of pH altering discharge. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the location each day of discharge during the qualifying event. Typically, representative samples will be spaced in time throughout the daily discharge event.

Stored or collected water from a qualifying storm event when discharged shall be tested for turbidity and pH (when applicable). Stored or collected water from a qualifying event may be sampled at the point it is released from the storage or containment area or at the site discharge location.

Run-on samples shall be collected whenever the QSP identifies that run-on has the potential to contribute to an exceedance of a NAL or the exceedance of a Receiving Water Monitoring Trigger.

7.7.4 Sampling Locations

Sampling locations are based on the site runoff discharge locations and locations where run-on enters the site; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the Site Maps in Appendix B and include the locations identified in Table 7.12 and Table 7-13.

One (1) sampling location has been identified on the EPS Demolition site for the collection of runoff samples.

Table 7-12: Turbidity & pH Runoff Locations

Sample Location #:	Sample Location	Estimate of Site (%)
B-02	Southern end of Central Drainage Channel	100% of detention basin overflow.

Table 7-13: Turbidity & pH Run-on Sample Locations

Sample Location #:	Sample Location	Estimate of Site (%)
B-01	Northern end of Vegetation Dirt Ditch	TBD

7.7.5 Monitoring Preparation

Turbidity and pH samples will be collected and analyzed by:

Contractor ☐ Yes ☒ No

Consultant ☒ Yes ☐ No

Laboratory ☐ Yes ☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Name/Telephone Number: TBD
Alternate(s)/Telephone Number: TBD

An adequate stock of monitoring supplies and equipment for monitoring turbidity and will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, field meters, extra batteries; clean powder free nitrile gloves, sample collection equipment, appropriate sample containers, paper towels, personal rain gear, and Effluent Sampling Field Log Sheets and CoC forms provided in CSMP Attachment 3 “Example Forms”.

The contractor will obtain and maintain the field-testing instruments, as identified in Section 7.7.2., for analyzing samples in the field by contractor sampling personnel.

Samples on the project site will be collected by the following [specify laboratory or environmental consultant]:

Company Name:
Street Address:
City, State, Zip:
Telephone Number:
Point of Contact:
Name of Sampler(s):
Name of Alternate(s):

The QSP or his/her designee will contact the onsite Stormwater Manager 24-hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins to ensure that adequate sample collection personnel, supplies for monitoring pH and turbidity are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.6 Field Parameters

Samples shall be analyzed for the constituents indicated in Table 7.14 below:

Table 7.14 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume[(1)]	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL	Polypropylene or Glass (Do not collect in meter sample cells)	1 NTU
pH	Field meter/probe with calibrated portable instrument or calibrated pH test kit	100 mL	Polypropylene	0.2 pH units

Notes: [1] Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions.

L – Liter
mL – Milliliter
NTU – Nephelometric Turbidity Unit

7.7.7 Sample Collection

Samples of discharge shall be collected at the designated runoff and run-on sampling locations shown on the Site Maps in Appendix B. Run-on samples shall be collected within close proximity of the point of run-on to the project.

Only personnel trained in water quality sampling and field measurements working under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.7.1 Field Measurements

Samples collected for field analysis, collection, analysis and equipment calibration shall be in accordance with the field instrument manufacturer's specifications. Immediately following collection, samples for field analysis shall be tested in accordance with the field instrument manufacturer's instructions and results recorded on the Effluent Sampling Field Log Sheet. The field instrument(s) listed in Table 7.15 will be used to analyze the following constituents:

Table 7-15: Field Instruments

Field Instrument (Manufacture & Model)	Constituent
TBD	pH
TBD	Turbidity

The manufacturers' instructions are included in CSMP Attachment 4 "Field Meter Instructions". Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurements of the samples.

- The instrument(s) shall be maintained in accordance with manufacturer's instructions.
- The instrument(s) shall be calibrated before each sampling and analysis event.
- Maintenance and calibration records shall be maintained with the SWPPP.

The QSP may authorize alternate equipment provided that the equipment meets the Construction General Permit's requirements and the manufacturers' instructions for calibration and use will be added to CSMP Attachment 4 "Field Meter Instructions".

7.7.7.2 Data Evaluation & Reporting

Immediately upon completing the measurements for the QRE, provide the *Effluent Sampling Field Log Sheets* to the QSP for evaluation.

7.7.7.3 Numeric Action Levels

This EPS Demolition Area project is subject to NALs for pH and turbidity (Table 7.16). Compliance with the NAL for pH and turbidity is based on a weighted daily average[3]. Upon receiving the field log sheets, the QSP shall immediately calculate the weighted arithmetic average of the turbidity samples, and the [weighted] logarithmic average of the pH samples to determine if the NALs, shown in the table below, have been exceeded.

Table 7-16: Numeric Action Levels

Parameter	Unit	Daily Average
pH	pH Units (standard units)	Lower NAL: 6.5 Upper NAL: 8.5
Turbidity	NTU	NTU: 250

The QSP shall within three (3) days of the sample collection submit copies of the completed Effluent Sampling Field Log Sheets to NRG.

In the event that the pH or turbidity NAL is exceeded, the QSP shall immediately notify the NRG Environmental Manager and investigate the cause of the exceedance and identify corrective actions.

Exceedances of NALs shall be electronically reported to the State Water Board by the QSP through the SMARTs system within 10 days of the conclusion of the storm event. If requested by the Regional Board, a NAL Exceedance report will be submitted. The NAL Exceedance Report must contain the following information:

- Analytical method(s), method reporting unit(s), and method detection limit(s) of each parameter;
- Date, place, time of sampling, visual observation, 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.

[3] Daily average pH values must be calculated through the logarithmic method. In order to calculate an average, you must: (1) Convert the pH measurements from logarithms to real numbers; (2) Take the average of the real numbers; and (3) Convert the average of the real numbers back to a logarithm.

7.7.7.4 Receiving Water Monitoring Triggers

This project is not subject to Receiving Water Monitoring Triggers.

7.7.7.5 Sampling & Analysis Plan: pH, Turbidity, and SSC in Receiving Water

This project is not subject to Receiving Water Monitoring.

7.7.8 Sampling & Analysis Plan for Non-Stormwater Discharges

This Sampling & Analysis Plan for non-stormwater discharges describes the sampling and analysis strategy and schedule for monitoring pollutants in authorized and unauthorized non-stormwater discharges from the project site in accordance with the requirements of the General Permit.

Sampling of non-stormwater discharges will be conducted when an authorized or unauthorized non-stormwater discharge is observed discharging from the project site. In the event that non-stormwater discharges run-on to the project site from offsite locations, and this run-on has the potential to contribute to a violation of a NAL, the run-on will also be sampled.

The following authorized non-stormwater discharges identified in Section 2.11, have the potential to be discharged from the project site.

- None

In addition to the above authorized stormwater discharges, some construction activities have the potential to result in an unplanned (unauthorized) non-stormwater discharge if BMPs fail. These activities include:

- None

7.7.8.1 Sampling Schedule

Samples of authorized or unauthorized non-stormwater discharges shall be collected when they are observed.

7.7.8.2 Sampling Locations

Samples shall be collected from the discharge point of the construction site where the non-stormwater discharge is running off the project site. Site discharge locations are shown on Figure XX (Appendix B) and include the locations identified below.

Sampling locations have yet to be identified on the EPS Demolition Project site where non-stormwater discharges may runoff from the project site. (Table 7.17).

Table 7-17: Non-Stormwater Discharge Sample Location

Sample Location Number	Sample Location	Latitude & Longitude
TBD	TBD	TBD

Table 7-18: Non-Stormwater Run-on Sample Locations

Sample Location Number	Sample Location	Latitude & Longitude
TBD	TBD	TBD

7.7.8.3 Monitoring Preparation

Non-stormwater discharge samples will be collected by:

Contractor	☐ Yes	☒ No
Consultant	☒ Yes	☐ No
Laboratory	☐ Yes	☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Name/Telephone Number:

Alternate(s)/Telephone Number:

An adequate stock of monitoring supplies and equipment for monitoring non-stormwater discharges will be available on the project site. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Personnel trained in sampling will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, clean powder free nitrile gloves, sample collection equipment, field meters, coolers, appropriate number and volume of sample bottles, identification labels, re sealable storage bags, paper towels, personal rain gear, ice, and Effluent Sampling Field Log Sheets and CoC forms provided in CSMP Attachment 3 “Example Forms”.

The contractor will obtain and maintain the field-testing instruments, as identified in Section 7.7.2, for analyzing samples in the field by contractor sampling personnel.

Samples on the project site will be collected by the following:

Company Name:

Street Address:	
City, State Zip:	
Telephone Number:	
Point of Contact:	
Name of Sampler(s):	
Name of Alternate(s):	

The QSP or his/her designee will contact the NRG Environmental Manager 24-hours prior to a planned non-stormwater discharge or as soon as an unplanned non-stormwater discharge is observed to ensure that adequate sample collection personnel, supplies for non-stormwater discharge monitoring are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.8.4 Analytical Constituents

All non-stormwater discharges that flow through a disturbed area shall, at minimum, be monitored for turbidity.

All non-stormwater discharges that flow through an area where they are exposed to pH altering materials shall be monitored for pH.

The QSP shall identify additional pollutants to be monitored for each non-stormwater discharge incident based on the source of the non-stormwater discharge. If the source of an unauthorized non-stormwater discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Non-stormwater discharge run-on shall be monitored, at minimum, for pH and turbidity. The QSP shall identify additional pollutants to be monitored for each non-stormwater discharge incident based on the source of the non-stormwater discharge. If the source of an unauthorized non-stormwater discharge is not known, monitoring for pH, turbidity, MBAS, TOC, and residual chlorine or chloramines is recommended to help identify the source of the discharge.

Table 7.19 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 7-19: Potential Non-Stormwater Discharge Pollutants & Water Quality Indicators

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Disturbed Areas	Sediment	Turbidity
Concrete Work	pH	pH

7.7.8.5 Sample Collection

Samples shall be collected at the discharge locations where the non-stormwater discharge is leaving the project site. Potential discharge locations are shown on the Site Maps in Appendix B and identified in Section 7.7.4.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7.14. Only personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.8.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7.14.

7.7.8.7 Data Evaluation & Reporting

The QSP shall complete an evaluation of the water quality sample analytical results.

Turbidity and pH results shall be evaluated for compliance with NALs and NEL as identified in Section 7.7.7.2.

Runoff results shall also be evaluated for the constituents suspected in the non-stormwater discharge. Should the runoff sample indicate the discharge of a pollutant which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

Non-storm water discharge results shall be submitted with the Annual Report.

The General Permit prohibits the non-storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 CFR §§ 117.3 and 302.4. The results of any non-stormwater discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board.

7.7.9 Sampling & Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

7.7.10 Active Treatment System Monitoring

An Active Treatment System (ATS) will be deployed on the site?

☐ Yes ☒ No

This EPS Demolition Project does not require a project specific Sampling and Analysis Plan for an ATS because deployment of an ATS is not planned.

7.8 Bioassessment Monitoring

This EPS Demolition Project is not subject to bioassessment monitoring because it is not a Risk Level 3 project.

7.9 Watershed Monitoring Option

This EPS Demolition Project is not participating in a watershed monitoring option.

7.10 Quality Assurance and Quality Control

An effective Quality Assurance and Quality Control (QA/QC) plan shall 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;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

7.10.1 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. A Visual Inspection Field Log, an Effluent Sampling Field Log Sheet, are included in CSMP Attachment 3 "Example Forms".

7.10.2 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. Adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.10.3 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. An example CoC is included in CSMP Attachment 3 "Example Forms".

7.10.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☒ Field Duplicates at a frequency of 1 duplicate per sampling year
(Required for all sampling plans with field measurements or laboratory analysis)

☐ Equipment Blanks:
(Only needed if equipment used to collect samples could add the pollutants to sample)

☐ Field Blanks:
(Only required if sampling method calls for field blanks)

☒ Travel Blanks at a frequency of one per sampling event
(Required for sampling plans that include VOC laboratory analysis)

7.10.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.10.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

7.10.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ionized water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

7.10.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ionized water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

7.10.5 Data Validation

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses 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. The QSP should especially note data that is an order of magnitude or more different than similar locations or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (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 accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent; Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and

- Review notations of any errors and actions taken to correct the equipment or recording errors.

7.10.6 Records Retention

All records of stormwater monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from date of submittal or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

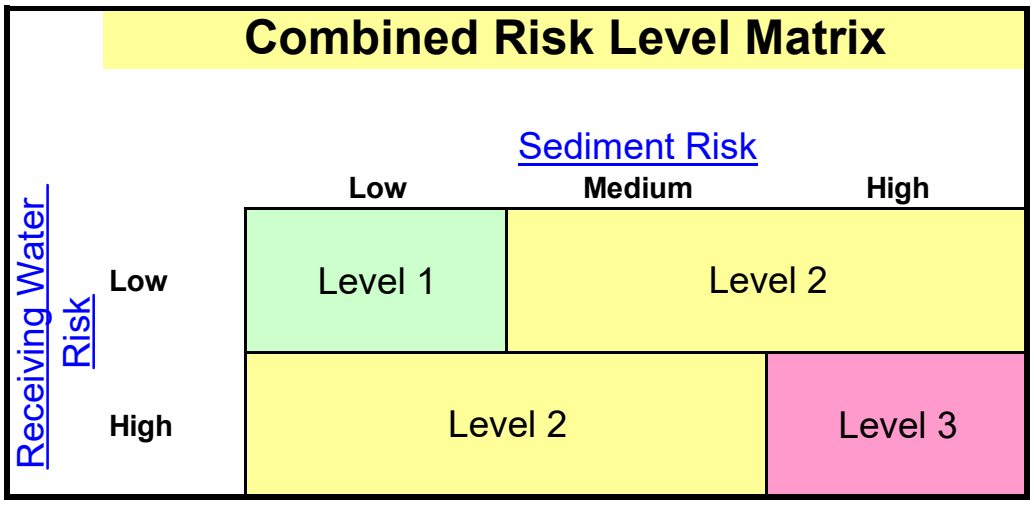
- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, 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;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections.

APPENDIX A – CALCULATIONS

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	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.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		75.06
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	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.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.2
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	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.		
12	LS Table		
13	**LS Factor Value**		1.69
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		25.37028
16	**Site Sediment Risk Factor**		**Medium**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

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 visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?:	**Yes**	**High**
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan)		
http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan		
Region 2 Basin Plan		
Region 3 Basin Plan		
Region 4 Basin Plan		
Region 5 Basin Plan		
Region 6 Basin Plan		
Region 7 Basin Plan		
Region 8 Basin Plan		
Region 9 Basin Plan		

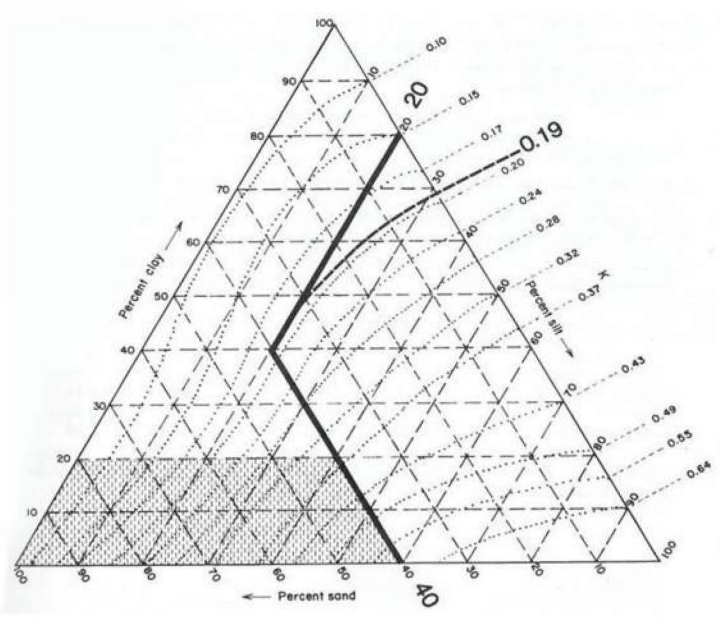
Combined Risk Level Matrix



Project Sediment Risk:	**Medium**
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.*

National Pollutant Discharge Elimination System (NPDES)

CONTACT US

SHARE

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool
- List of states, Indian country, and territories where EPA is the permitting authority
- Construction Rainfall Erosivity Waiver Fact Sheet
- Appendix C of the 2017 CGP – Small Construction Waivers and Instructions

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

For questions or comments, email EPA's CGP staff at cgp@epa.gov.

Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 10/01/2019 **End Date:** 12/31/2021

Locate your small construction project using the search box below or by clicking on the map.

Location: 4600 carlsbad blvd., carlsbad, ca **Search**

Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 10/01/2019	**Latitude:** 33.1378
End Date: 12/31/2021	**Longitude:** -117.3384

Calculation Results

Rainfall erosivity factor (R Factor) = **75.06**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority, you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

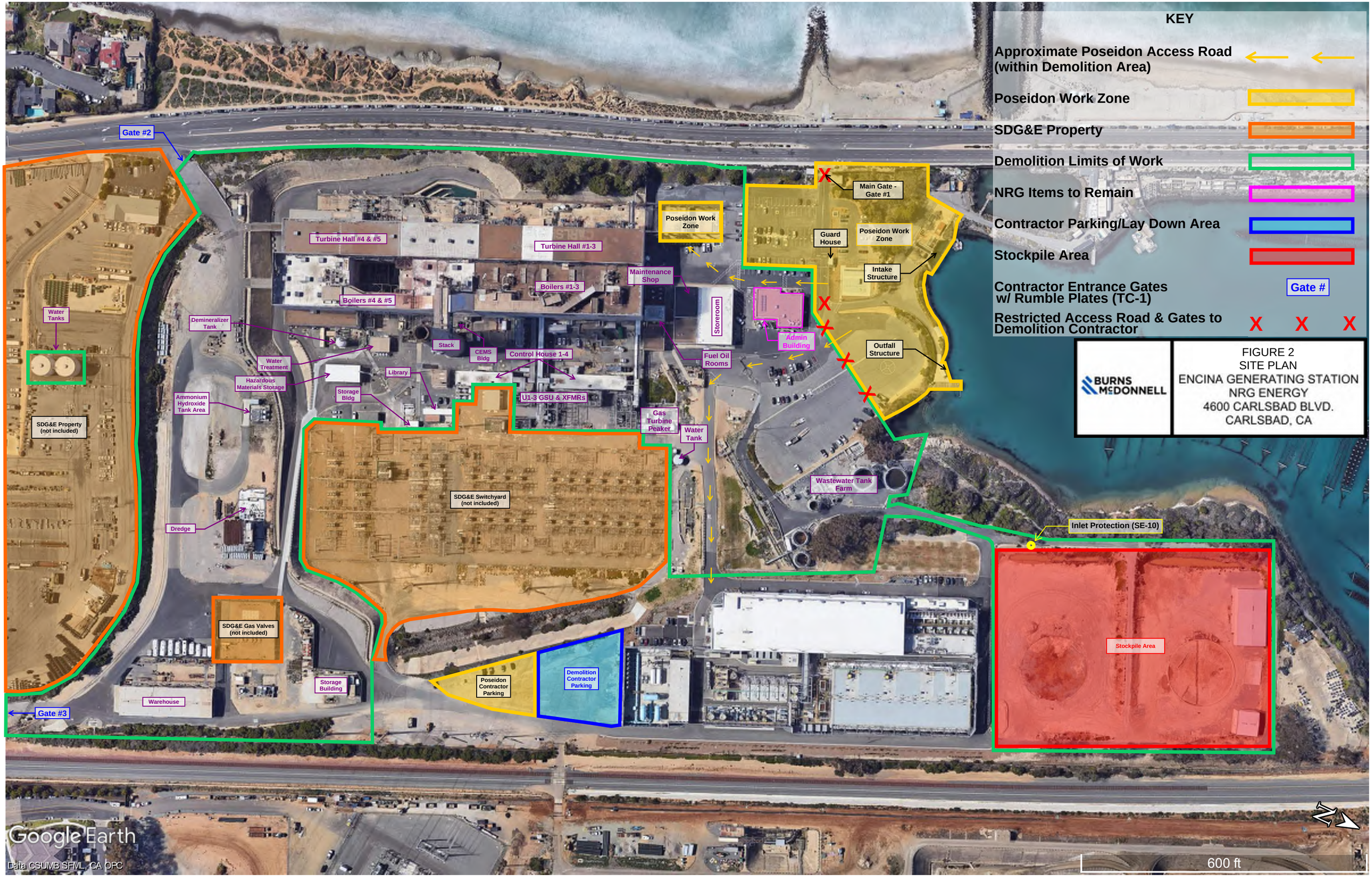
APPENDIX B – SITE PLANS

N

Source: Google Earth

BURNS McDONNELL

FIGURE 1
SITE VICINITY MAP
ENCINA GENERATING STATION
NRG ENERGY
4600 CARLSBAD BLVD.
CARLSBAD, CA


KEY
Approximate Poseidon Access Road (within Demolition Area)
Poseidon Work Zone
SDG&E Property
Demolition Limits of Work
NRG Items to Remain
Contractor Parking/Lay Down Area
Stockpile Area
Contractor Entrance Gates w/ Rumble Plates (TC-1)
Gate #
Restricted Access Road & Gates to Demolition Contractor
X X X
BURNS McDONNELL
FIGURE 2
SITE PLAN
ENCINA GENERATING STATION
NRG ENERGY
4600 CARLSBAD BLVD.
CARLSBAD, CA
Gate #2
Gate #3
Turbine Hall #4 & #5
Turbine Hall #1-3
Boilers #4 & #5
Boilers #1-3
Maintenance Shop
Storeroom
Poseidon Work Zone
Main Gate - Gate #1
Guard House
Poseidon Work Zone
Intake Structure
Admin Building
Outfall Structure
Water Tanks
SDG&E Property (not included)
Demineralizer Tank
Water Treatment
Hazardous Materials Storage
Ammonium Hydroxide Tank Area
Stack
CEMS Bldg
Control House 1-4
Library
Storage Bldg
U1-3 GSU & XFMRs
Fuel Oil Rooms
Gas Turbine Peaker
Water Tank
Wastewater Tank Farm
SDG&E Switchyard (not included)
Dredge
SDG&E Gas Valves (not included)
Warehouse
Storage Building
Poseidon Contractor Parking
Demolition Contractor Parking
Inlet Protection (SE-10)
Stockpile Area
Google Earth
Data CSUMB SFML, CA OPC
600 ft

ATCHISON TOPEKA AND SANTA FE RAILROAD MAIN LINE

STOCKPILE AREA

WAREHOUSE

STORAGE BUILDING

WASTEWATER TANK FARM

SDG&E SWITCHYARD

DRAINAGE BASIN

GSUs

GSUs

STACK

WATER TANKS

AGUA HEDIONDA LAGOON

ADMIN BUILDING

STOREROOM

MAINTENANCE SHOP

FUEL OIL ROOMS

BOILERS

BOILERS

TURBINE HALL

SECURITY BUILDING

CARLSBAD BLVD

LEGEND

FENCE

INLET W/ INLET PROTECTION (SE-10)

SURFACE FLOW DIRECTION

NORTH

0 60' 120'

SCALE IN FEET

no.	date	by	ckd	description
A	4/30/19	HJH	JLP	ISSUED FOR REVIEW

BURNS McDONNELL

1431 OPUS PLACE, SUITE 400
DOWNERS GROVE, ILLINOIS 60515
630-724-3200

date	detailed
APRIL 29, 2019	D. CHAVEZ
designed	checked
H. HINKE	D. BARRIS

NRG ENERGY
4600 CARLSBAD BLVD
CARLSBAD, CALIFORNIA

ENCINA GENERATING STATION DEMOLITION
SITE PLAN

project	contract
115381	-

drawing **CS01** – rev. **A**

sheet of sheets

file 115381_CS101.DWG

Z:\CLIENTS\ENS\NRGENERGY\115381_ENCINADEMOOE\DESIGN\CADD\DWGS\115381_CS101.DWG 4/29/2019 2:44:19 PM DCHAVEZ

Scale For Microfilming
Millimeters
Inches

APPENDIX C – PROJECT REGISTRATION DOCUMENTS

Approved Date: October 01, 2019

Simon Barber
Cabrillo Power LLC
4600 Carlsbad Blvd
Carlsbad CA 92008

RECEIPT OF YOUR NOTICE OF INTENT (NOI)

The State Water Resources Control Board (State Water Board) has received and processed your NOI to comply with the terms of the General Permit to Discharger Storm Water Associated with Construction Activity. Accordingly, you are required to comply with the permit requirements.

The Waste Discharger Identification (WDID) number is: **9 37C388251** . Please use this number in any future communication regarding this permit.

	SITE DESCRIPTION
OWNER:	Cabrillo Power LLC
DEVELOPER:	Cabrillo Power LLC
SITE INFORMATION:	Encina Power Station Demolition 4600 Carlsbad Blvd 4600 Carlsbad Blvd Carlsbad
TOTAL DISTURBED ACRES:	28
START DATE:	October 01, 2019
COMPLETION DATE:	December 31, 2021
COUNTY:	San Diego

When the Owner changes , a new NOI, site map, and fee must be submitted by the new Owner. As the previous owner, you are required to submit a Notice of Termination (NOT) to the local Regional Water Board stating you no longer own or operate the Site and coverage under the General Permit is not required. Unless notified, you will continue and are responsible to pay the annual fee invoiced each October.

If you have any questions regarding permit requirements, please contact your Regional Water Board at 619-516-1990 . Please visit the storm water web site at http://www.waterboards.ca.gov/water_issues/programs/stormwater/ to obtain an NOT and other storm water related information and forms.

Sincerely,

Storm Water Section
Division of Water Quality

State Water Resources Control Board

NOTICE OF INTENT

GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY
(WQ ORDER No. 2009-0009-DWQ)

WDID: 9 37C388251 **Risk Level:** Level2

Property Owner Information

Type: Private Business

Name:	Cabrillo Power LLC	Contact Name:	Simon Barber
Address:	4600 Carlsbad Blvd	Title:	Geologist
Address 2:		Phone Number:	650-871-2661
City/State/Zip:	Carlsbad CA 92008	Email Address:	sbarber@burnsmcd.com

Contractor/Developer Information

Name:	Cabrillo Power LLC	Contact Name:	Tim Sisk
Address:	4600 Carlsbad Blvd	Title:	Manager-Environmental Business
Address 2:		Phone Number:	760-930-1507
City/State/Zip:	Carlsbad CA 92008	Email Address:	tim.sisk@nrg.com

Construction Site Information

Contact Name:	Tim Sisk	Title:	Manager-Environmental Business
Site Name:	Encina Power Station Demolition		
Address:	4600 Carlsbad Blvd 4600 Carlsbad Blvd		
City/State/Zip:	Carlsbad CA 92008	Site Phone #:	760-930-1507
County:	San Diego	Email Address:	tim.sisk@nrg.com
Latitude:	33.1378	Longitude:	-117.33843
Construction Start:	October 01, 2019		
Total Size of Construction Area:	42.5	Complete Grading:	December 31, 2021
Total Area to be Disturbed:	28 Acres	Final Stabilization:	December 31, 2021

Risk Values

R: 75.06 K: 0.2 LS: 1.69 Beneficial Uses/303(d): Yes

Type of Construction: *Industrial

Receiving Water: Agua Hedionda Lagoon

Qualified SWPPP Developer: Simon Barber Certification #: 23921

RWQCB Jurisdiction: Region 9 - San Diego

Phone: 619-516-1990 Email: r9_stormwater@waterboards.ca.gov

Certification

Name: Jerry Carter Date: September 26, 2019

Title: Plant Manager

State Water Resources Control Board

NOTICE OF INTENT

GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY
(WQ ORDER No. 2009-0009-DWQ)

WDID: 9 37C388251

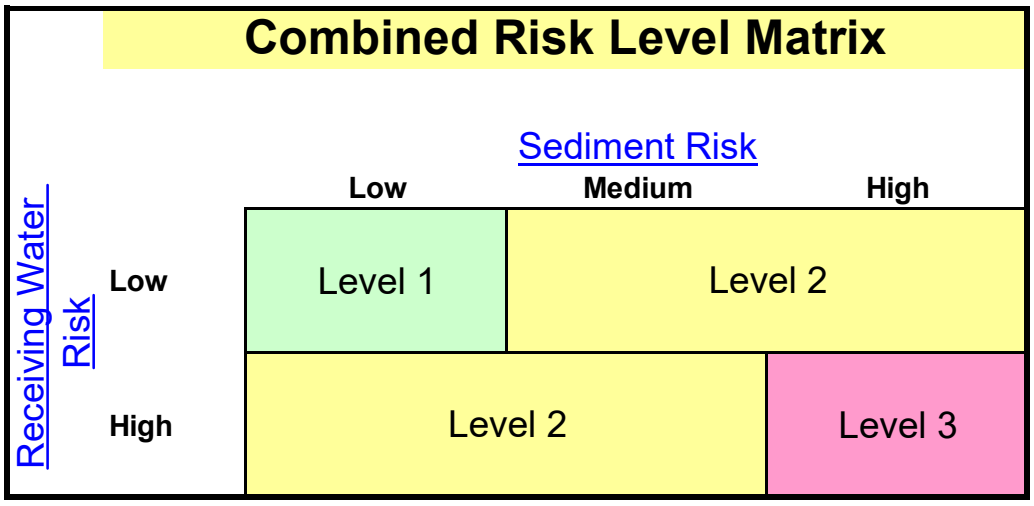
Post Construction Information

Is the project located within a permitted Phase I or Phase II Municipal Separate Storm Sewer System?: _____

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	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.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		75.06
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	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.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.2
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	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.		
12	LS Table		
13	**LS Factor Value**		1.69
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		25.37028
16	**Site Sediment Risk Factor**		**Medium**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

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 visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?:	**Yes**	**High**
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan)		
http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan		
Region 2 Basin Plan		
Region 3 Basin Plan		
Region 4 Basin Plan		
Region 5 Basin Plan		
Region 6 Basin Plan		
Region 7 Basin Plan		
Region 8 Basin Plan		
Region 9 Basin Plan		

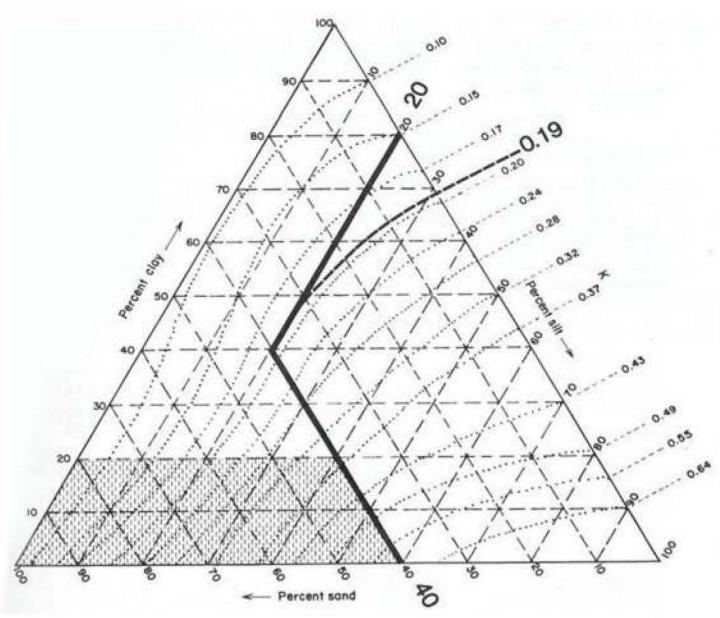
Combined Risk Level Matrix



Project Sediment Risk:	**Medium**
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.
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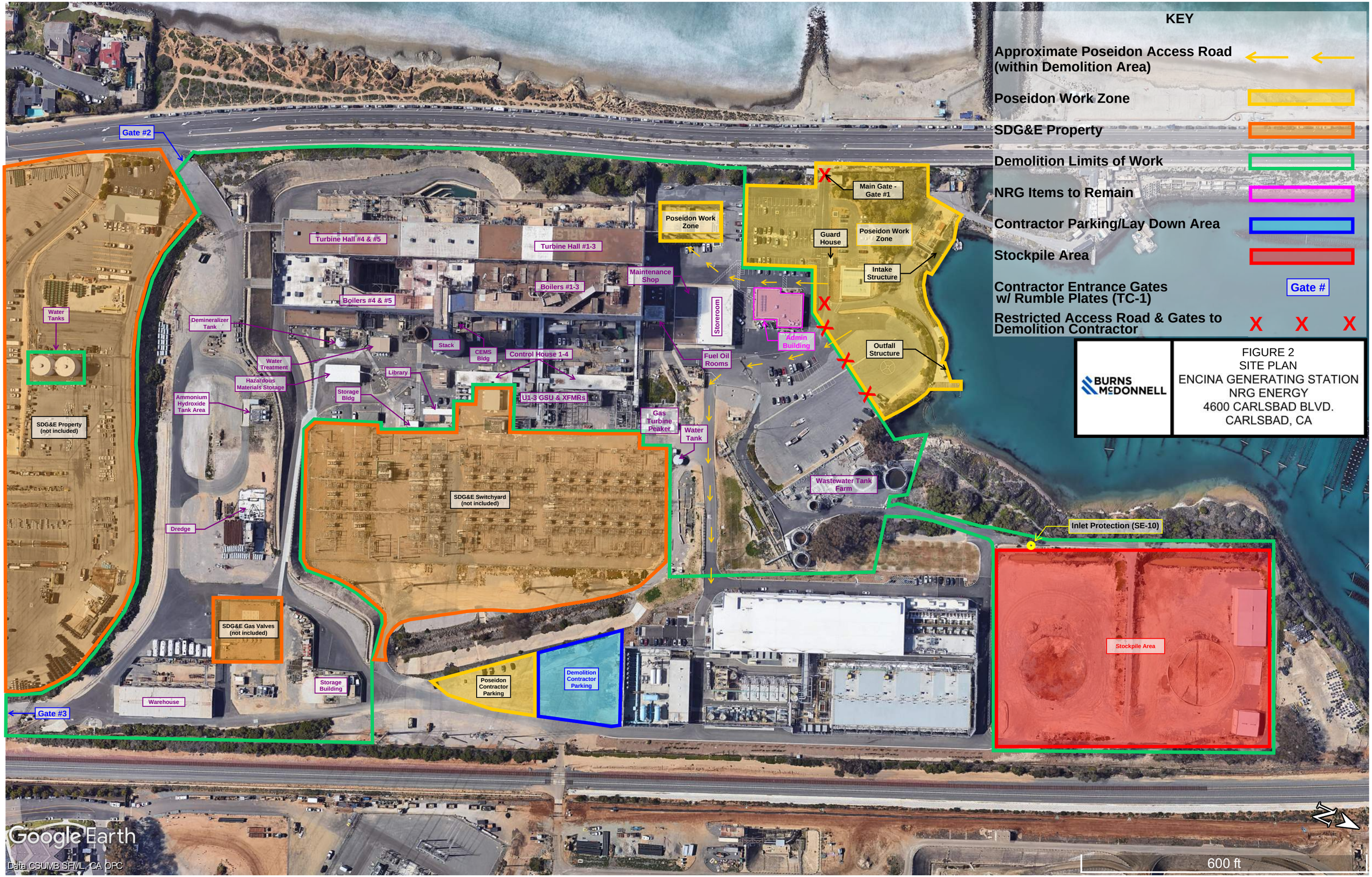

KEY
Approximate Poseidon Access Road (within Demolition Area)
Poseidon Work Zone
SDG&E Property
Demolition Limits of Work
NRG Items to Remain
Contractor Parking/Lay Down Area
Stockpile Area
Contractor Entrance Gates w/ Rumble Plates (TC-1)
Gate #
Restricted Access Road & Gates to Demolition Contractor
X X X
BURNS McDONNELL
FIGURE 2
SITE PLAN
ENCINA GENERATING STATION
NRG ENERGY
4600 CARLSBAD BLVD.
CARLSBAD, CA
Gate #2
Gate #3
Turbine Hall #4 & #5
Turbine Hall #1-3
Boilers #4 & #5
Boilers #1-3
Maintenance Shop
Storeroom
Poseidon Work Zone
Main Gate - Gate #1
Guard House
Poseidon Work Zone
Intake Structure
Admin Building
Outfall Structure
Water Tanks
Demineralizer Tank
Stack
CEMS Bldg
Control House 1-4
Fuel Oil Rooms
Water Treatment
Hazardous Materials Storage
Library
Storage Bldg
Ammonium Hydroxide Tank Area
U1-3 GSU & XFMRs
Gas Turbine Peaker
Water Tank
SDG&E Property (not included)
SDG&E Switchyard (not included)
Wastewater Tank Farm
Dredge
Inlet Protection (SE-10)
SDG&E Gas Valves (not included)
Stockpile Area
Storage Building
Warehouse
Poseidon Contractor Parking
Demolition Contractor Parking
Google Earth
Data CSUMB SFML, CA OPC
600 ft

APPENDIX D – AMENDMENT CERTIFICATIONS

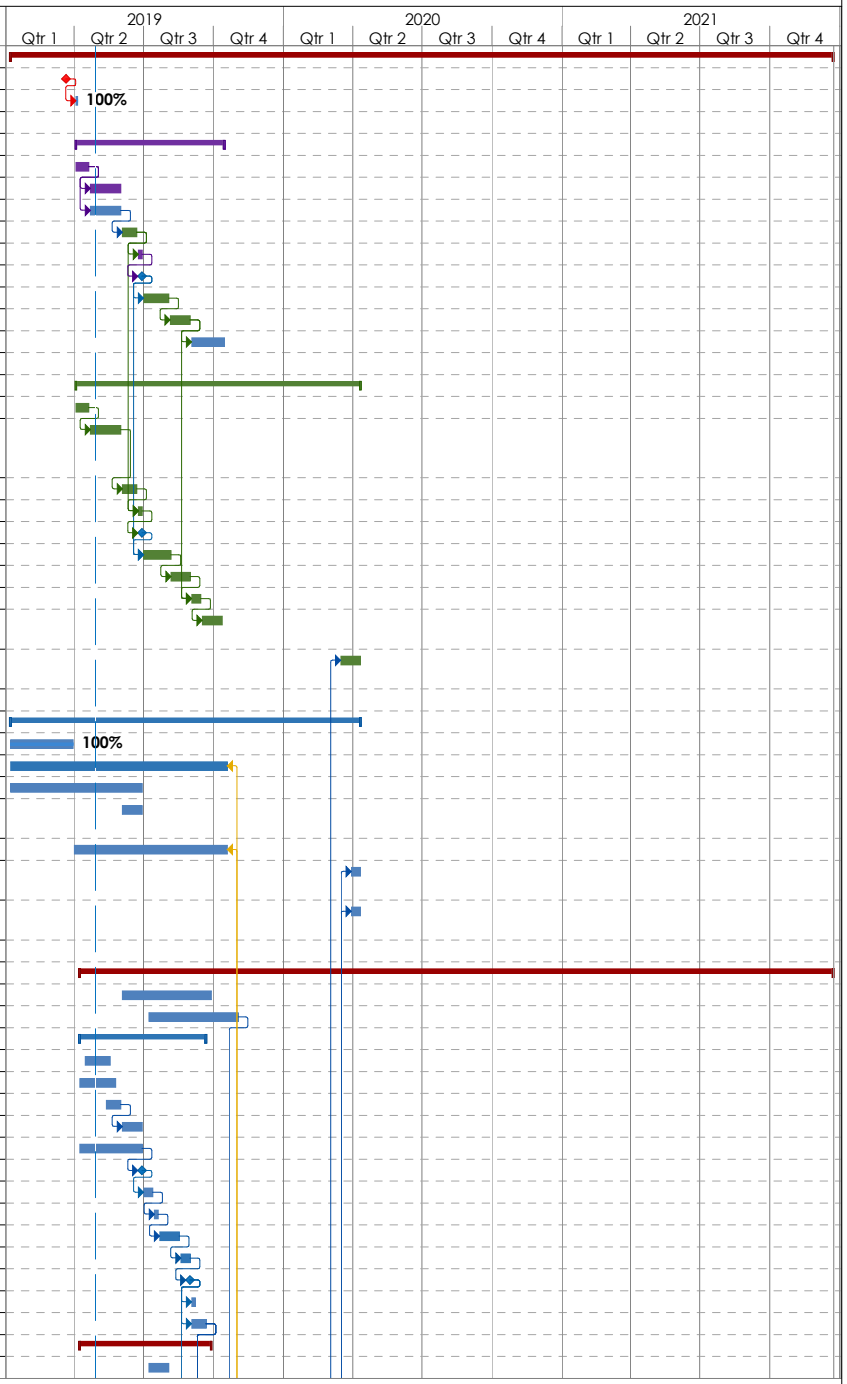
APPENDIX E – SUBMITTED CHANGES TO PRD

APPENDIX F – CONSTRUCTION SCHEDULE

BURNS McDONNELL

Demolition Project Schedule

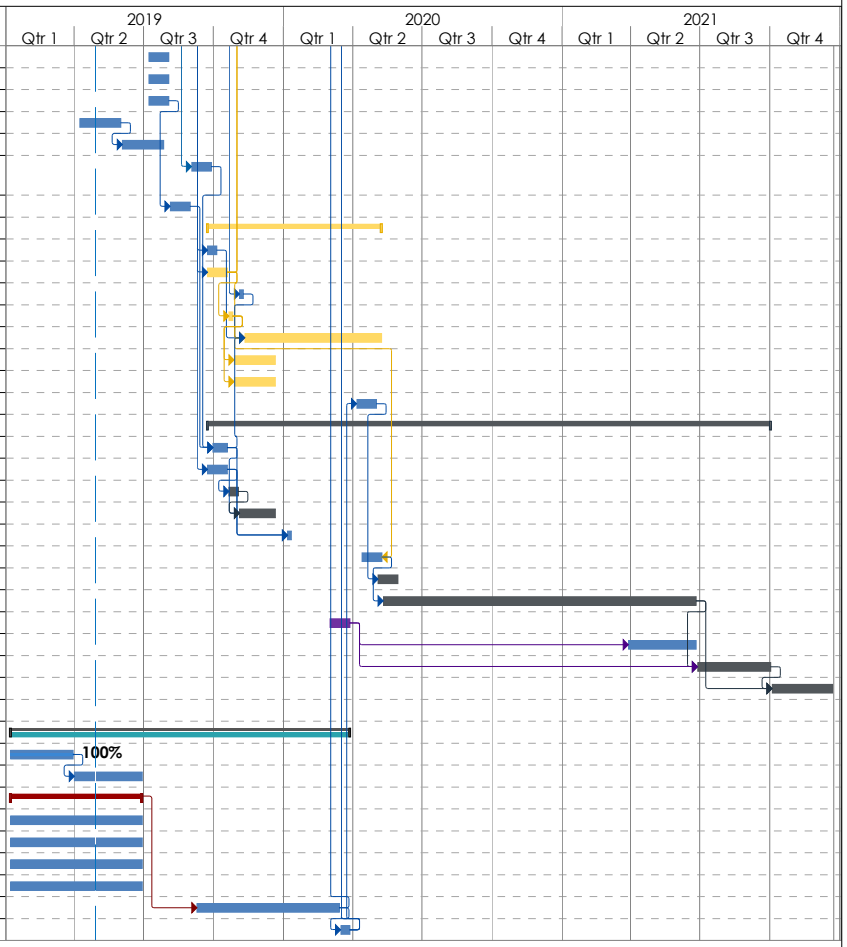
ID	Task Name	Duration	Start	Finish	% Complete	Predecessors
1	**Encina Demolition Project**	**151.9 wks**	**Mon 1/7/19**	**Thu 12/23/21**	**3%**	
2	Notice to Proceed	0 wks	Wed 3/20/19	Wed 3/20/19	100%	
3	Kick-Off Meeting	0.4 wks	Wed 4/3/19	Thu 4/4/19	100%	2
4						
5	**IT/Telecommunications Modifications**	**27.2 wks**	**Wed 4/3/19**	**Mon 10/14/19**	**0%**	
6	Field Verification of Isolation Points	2.6 wks	Wed 4/3/19	Fri 4/19/19	0%	
7	Rerouting Plan of Telecomm from Control House 1&2	5.8 wks	Mon 4/22/19	Fri 5/31/19	0%	6
8	Rerouting Plan of Telecomm for Administration Bldg.	5.8 wks	Mon 4/22/19	Fri 5/31/19	0%	6
9	IFR - 100% Final Design	3 wks	Mon 6/3/19	Fri 6/21/19	0%	8
10	NRG Review	1 wk	Mon 6/24/19	Fri 6/28/19	0%	9
11	IFC - Work Package	0 wks	Fri 6/28/19	Fri 6/28/19	0%	10
12	Equipment Procurement	4.8 wks	Mon 7/1/19	Fri 8/2/19	0%	11
13	Equipment Installation	4 wks	Mon 8/5/19	Fri 8/30/19	0%	12
14	Reconnect Power	6 wks	Mon 9/2/19	Mon 10/14/19	0%	13
15						
16	**Electrical Isolation/Modifications**	**52.2 wks**	**Wed 4/3/19**	**Fri 4/10/20**	**0%**	
17	Field Verification of Power Sources/Isolation Points	2.6 wks	Wed 4/3/19	Fri 4/19/19	0%	
18	Design Utility Tie-in/Reroute for Security Trailers, Overhead Crane, Basement Sumps, Elevator, Admin. Bldg., Warehouse, Stack Lights, & Security Cameras	5.8 wks	Mon 4/22/19	Fri 5/31/19	0%	17
19	IFR - 100% Final Design	3 wks	Mon 6/3/19	Fri 6/21/19	0%	18
20	NRG Review	1 wk	Mon 6/24/19	Fri 6/28/19	0%	19,9
21	IFC - Work Package	0 wks	Fri 6/28/19	Fri 6/28/19	0%	20
22	Equipment Procurement	5 wks	Mon 7/1/19	Mon 8/5/19	0%	21,11
23	Equipment Installation	3.8 wks	Tue 8/6/19	Fri 8/30/19	0%	22
24	Drop Tie-ins	1.8 wks	Mon 9/2/19	Fri 9/13/19	0%	23,13
25	NRG Personnel De-energize Units & Plant (Excluding systems required for Water Circ. System)	4 wks	Mon 9/16/19	Fri 10/11/19	0%	24
26	NRG Personnel De-energize systems required for Water Circ. System	4 wks	Mon 3/16/20	Fri 4/10/20	0%	94
27						
28	**Plant Decommissioning**	**64.6 wks**	**Mon 1/7/19**	**Fri 4/10/20**	**11%**	
29	Natural Gas Disconnect	12 wks	Mon 1/7/19	Fri 3/29/19	100%	
30	Ammonium Hydroxide Tank Sale	40.4 wks	Mon 1/7/19	Fri 10/18/19	0%	65FF
31	Fuel, Lubricating and Hydraulic Oil Removal	24.8 wks	Mon 1/7/19	Fri 6/28/19	0%	
32	Transformer Oil Removal (Excluding systems required for Water Circ. System)	4 wks	Mon 6/3/19	Fri 6/28/19	0%	
33	Owner Debris Removal & Equipment Salvage	28.4 wks	Mon 4/1/19	Fri 10/18/19	0%	65FF
34	Tranformer Oil Removal for systems that were required for Water Circ. System	2 wks	Mon 3/30/20	Fri 4/10/20	0%	95
35	Fuel, Lubricating and Hydraulic Oil Removal for systems that were required for Water Circ. System	2 wks	Mon 3/30/20	Fri 4/10/20	0%	95
36						
37	**Plant Abatement / Demolition**	**138.9 wks**	**Mon 4/8/19**	**Thu 12/23/21**	**0%**	
38	Bird Nest Relocation	16.6 wks	Mon 6/3/19	Fri 9/27/19	0%	
39	Water Line (Title 22) Installation at Property Line by City	16.8 wks	Mon 7/8/19	Fri 11/1/19	0%	
40	**Pre-Abatement / Demolition**	**23.4 wks**	**Mon 4/8/19**	**Fri 9/20/19**	**0%**	
41	Demolition Estimate	5 wks	Mon 4/15/19	Fri 5/17/19	0%	
42	Contractor Pre-Qualification Evaluation	7 wks	Mon 4/8/19	Fri 5/24/19	0%	
43	Regulated Materials Assessment	2.8 wks	Mon 5/13/19	Fri 5/31/19	0%	
44	Regulated Materials Report	4 wks	Mon 6/3/19	Fri 6/28/19	0%	43
45	Develop Draft Abatement/Demolition Bid Documents	11.8 wks	Mon 4/8/19	Fri 6/28/19	0%	
46	Submit Draft Bid Documents to NRG	0 wks	Fri 6/28/19	Fri 6/28/19	0%	45
47	NRG Review	1.8 wks	Mon 7/1/19	Fri 7/12/19	0%	46
48	IFB - Finalize Abatement/Demolition Bid Documents	1 wk	Mon 7/15/19	Fri 7/19/19	0%	47
49	Bid Process	4 wks	Mon 7/22/19	Fri 8/16/19	0%	48
50	Bid Evaluation	2 wks	Mon 8/19/19	Fri 8/30/19	0%	49
51	Project Award	0 wks	Fri 8/30/19	Fri 8/30/19	0%	50
52	IFC - Abatement/Demolition Documents	0.8 wks	Mon 9/2/19	Fri 9/6/19	0%	51
53	Project Contracting	2.8 wks	Mon 9/2/19	Fri 9/20/19	0%	51
54	**Issue Permit Application to CBO**	**24.4 wks**	**Mon 4/8/19**	**Fri 9/27/19**	**0%**	
55	Security Plan	4 wks	Mon 7/8/19	Fri 8/2/19	0%	



BURNS McDONNELL

Demolition Project Schedule

ID	Task Name	Duration	Start	Finish	% Complete	Predecessors
56	Parking & Staging Plan	4 wks	Mon 7/8/19	Fri 8/2/19	0%	
57	Noise Notification	4 wks	Mon 7/8/19	Fri 8/2/19	0%	
58	Air Quality Plan	4 wks	Mon 7/8/19	Fri 8/2/19	0%	
59	Storm Water Pollution Prevention Plan	7.8 wks	Mon 4/8/19	Fri 5/31/19	0%	
60	SWPPP Permit	7.8 wks	Mon 6/3/19	Fri 7/26/19	0%	59
61	Contractor Demolition & Construction Safety and Health Program	3.8 wks	Mon 9/2/19	Fri 9/27/19	0%	51
62	CBO Review	4 wks	Mon 8/5/19	Fri 8/30/19	0%	58
63	**Environmental Abatement**	**32.1 wks**	**Mon 9/23/19**	**Fri 5/8/20**	**0%**	
64	Asbestos Renovation Notification to SDAPCD	2 wks	Mon 9/23/19	Fri 10/4/19	0%	53
65	Mobilization/Submittals	4 wks	Mon 9/23/19	Fri 10/18/19	0%	53
66	Water Line (Title 22) Permit, Meter, and Installation	1 wk	Mon 11/4/19	Fri 11/8/19	0%	39
67	Utility Isolation Verification	1 wk	Mon 10/21/19	Fri 10/25/19	0%	65
68	ACM Abatement	25.1 wks	Mon 11/11/19	Fri 5/8/20	0%	67,65,64,73,66
69	Universal Waste Removal	7.8 wks	Mon 10/28/19	Fri 12/20/19	0%	67
70	Residual Regulated Material Removal	7.8 wks	Mon 10/28/19	Fri 12/20/19	0%	67
71	Environmental Cleanup of Intake Tunnels/Channels	4 wks	Mon 4/6/20	Fri 5/1/20	0%	95FS+1 wk
72	**Demolition**	**104.2 wks**	**Mon 9/23/19**	**Fri 10/1/21**	**0%**	
73	CBO Issue Permit	3 wks	Mon 9/30/19	Fri 10/18/19	0%	62,61
74	Mobilization/Submittals	4 wks	Mon 9/23/19	Fri 10/18/19	0%	53
75	Stormwater Controls Installation	2 wks	Mon 10/21/19	Fri 11/1/19	0%	74
76	Out-Building/Structure Demolition	6.8 wks	Mon 11/4/19	Fri 12/20/19	0%	75,73
77	Water Tank Demo on SDG&E Property	1 wk	Mon 1/6/20	Fri 1/10/20	0%	74,73
78	Mobilization for Power Block Demolition	4 wks	Mon 4/13/20	Fri 5/8/20	0%	68SF
79	Intake/Discharge Closure	4 wks	Mon 5/4/20	Fri 5/29/20	0%	71
80	Power Block Demolition	58 wks	Mon 5/11/20	Fri 6/25/21	0%	78
81	Disconnect First Responders Satellites on Stack	4 wks	Mon 3/2/20	Fri 3/27/20	0%	
82	60-Day Notification to FAA for Stack Lights	13 wks	Mon 3/29/21	Fri 6/25/21	0%	81
83	Chimney Demolition	14 wks	Mon 6/28/21	Fri 10/1/21	0%	80,81
84	Site Restoration	11.3 wks	Mon 10/4/21	Thu 12/23/21	0%	80,83
85						
86	**Poseidon Pumping Project**	**62.6 wks?**	**Mon 1/7/19**	**Fri 3/27/20**	**8%**	
87	30% Drawings	12 wks	Mon 1/7/19	Fri 3/29/19	100%	
88	60% Drawings	12.8 wks	Mon 4/1/19	Fri 6/28/19	0%	87
89	**Permit & Approvals**	**24.8 wks**	**Mon 1/7/19**	**Fri 6/28/19**	**0%**	
90	Environmental Management Plan	24.8 wks	Mon 1/7/19	Fri 6/28/19	0%	
91	QA / QC Plan	24.8 wks	Mon 1/7/19	Fri 6/28/19	0%	
92	Transportation Plan	24.8 wks	Mon 1/7/19	Fri 6/28/19	0%	
93	Storm Water Pollution Prevention Plan	24.8 wks	Mon 1/7/19	Fri 6/28/19	0%	
94	Poseidon Piping Installation	26.2 wks	Mon 9/9/19	Fri 3/13/20	0%	89
95	Poseidon Install of Stop Logs	2 wks	Mon 3/16/20	Fri 3/27/20	0%	94

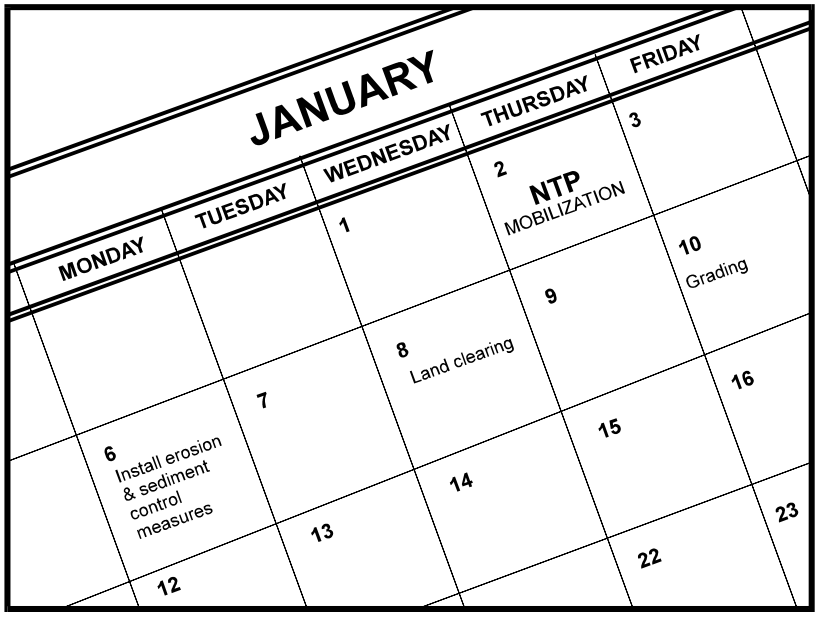


APPENDIX G – CONSTRUCTION ACTIVITIES MATERIALS

Pollutant (List pollutants and source, if applicable)
Building Demolition/Asphalt Concrete Demolition: Metals, Dust
Diesel Fuel: Heavy equipment refueling
Oil & Grease: Preventative maintenance of equipment
Welding Materials: Structural component(s) installation
Hydraulic Fluids: Heavy equipment
Paint: Outdoor equipment components
Heavy metals
Construction debris:
General Construction Wastes: trash, packaging (plastics, metals, cardboard, etc.), wood pallets.
Sanitary Wastes: Port-o-Johns, wash stations, garbage receptacles
Concrete/Concrete sealants: pH

APPENDIX H – CASQA BMP FACT SHEETS

Scheduling EC-1



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

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

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

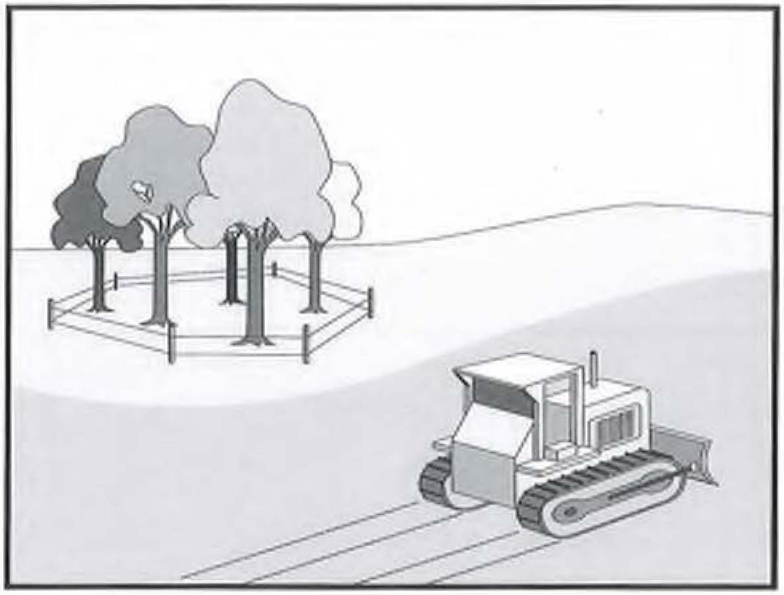
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

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.

Preservation Of Existing Vegetation EC-2

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.

Preservation Of Existing Vegetation EC-2

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

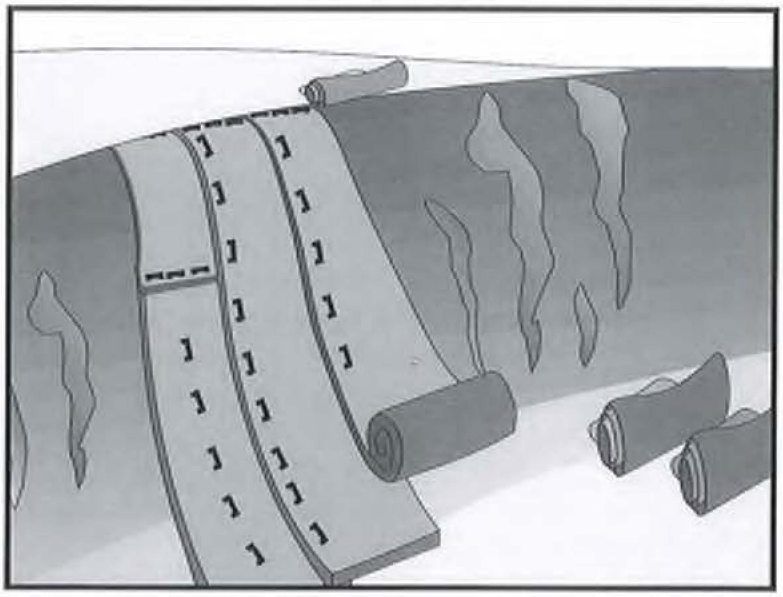
County of Sacramento Tree Preservation Ordinance, September 1981.

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.

Geotextiles and Mats EC-7



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

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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 (2004)[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: Cost information received from individual product manufacturers solicited by Geosyntec Consultants (2004).
2. 2009 costs reflect a 10% escalation over year 2004 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.

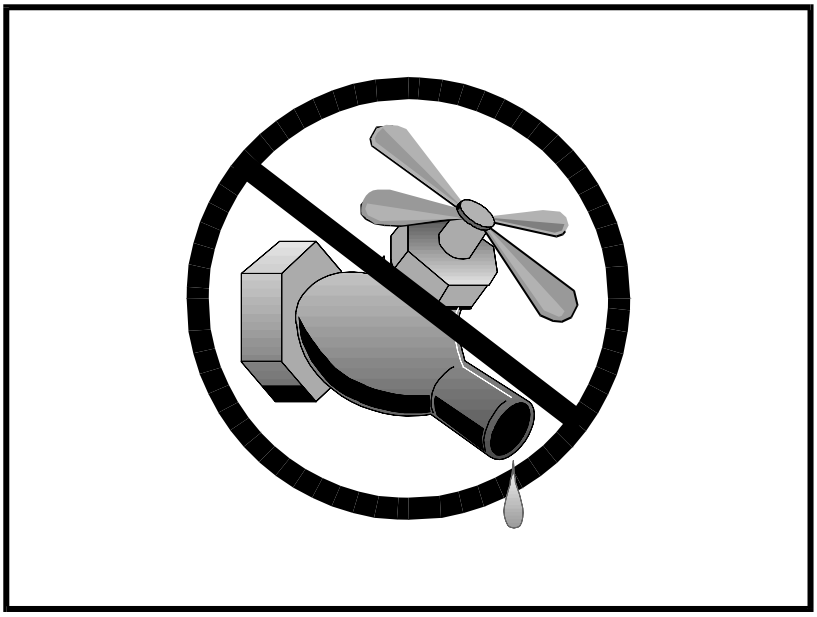
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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.

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

Water Conservation Practices NS-1



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 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.

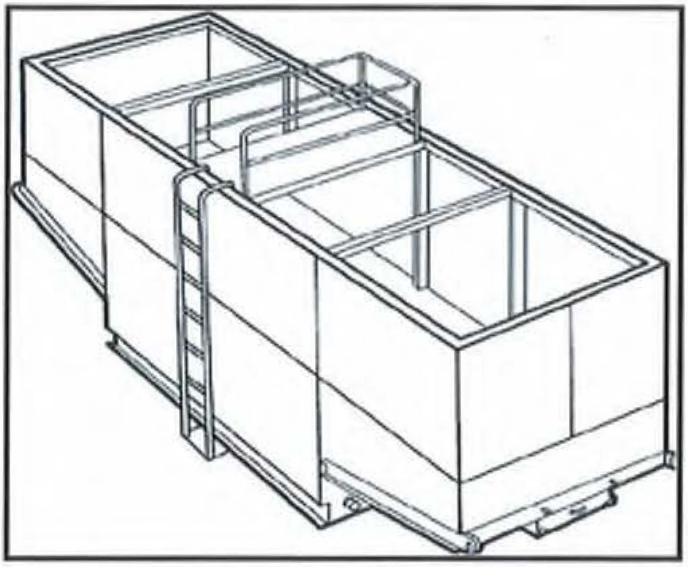
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs 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 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.

Dewatering Operations NS-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**

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 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 exceedances of the General Permit requirements or Basin Plan standards.

The dewatering operations described in this fact sheet are not Active Treatment Systems (ATS) and do not include the use of chemical coagulations, chemical flocculation or electrocoagulation.

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

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

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

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 for the discharge. For example, when discharging to a water of the U.S., a dewatering permit may 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 from 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 or turbidity 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 (see 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.

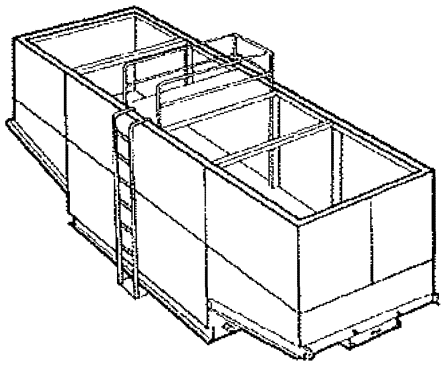
Implementation:

- 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.

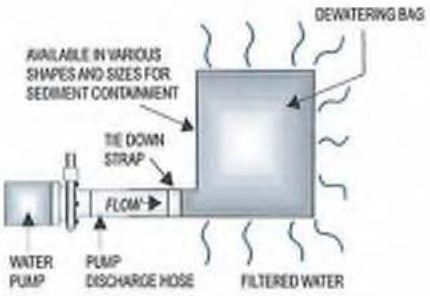
Implementation:

- 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.

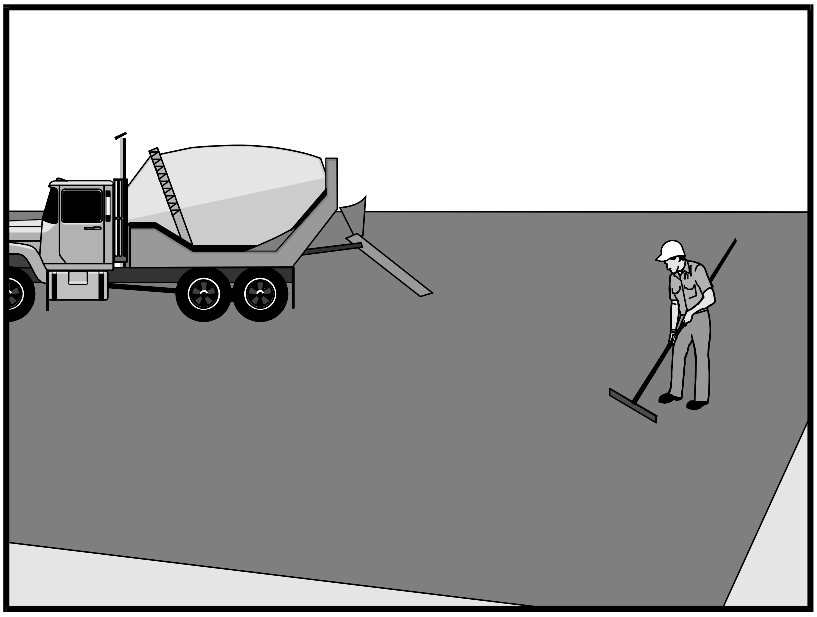
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

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.

Paving and Grinding Operations NS-3



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 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

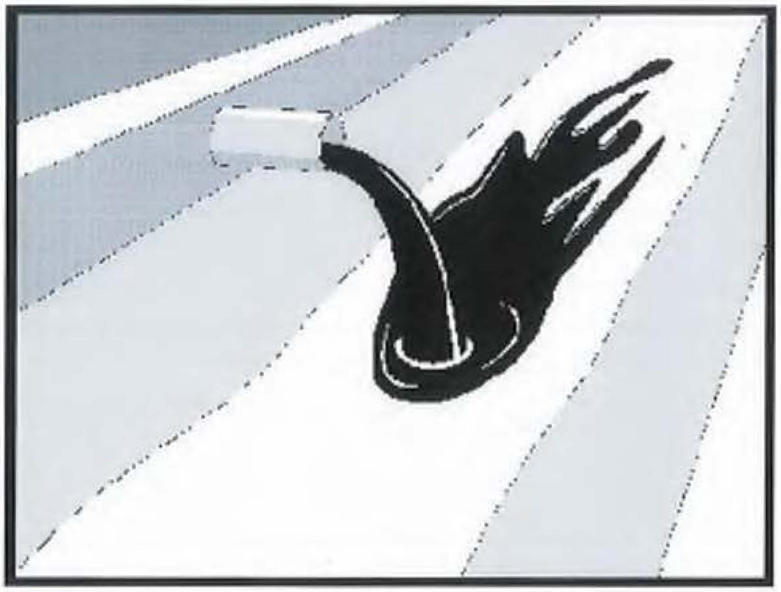
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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.

Illicit Connection/Discharge NS-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

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.

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- Inspect site regularly during project execution for evidence 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 BMPs 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 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.

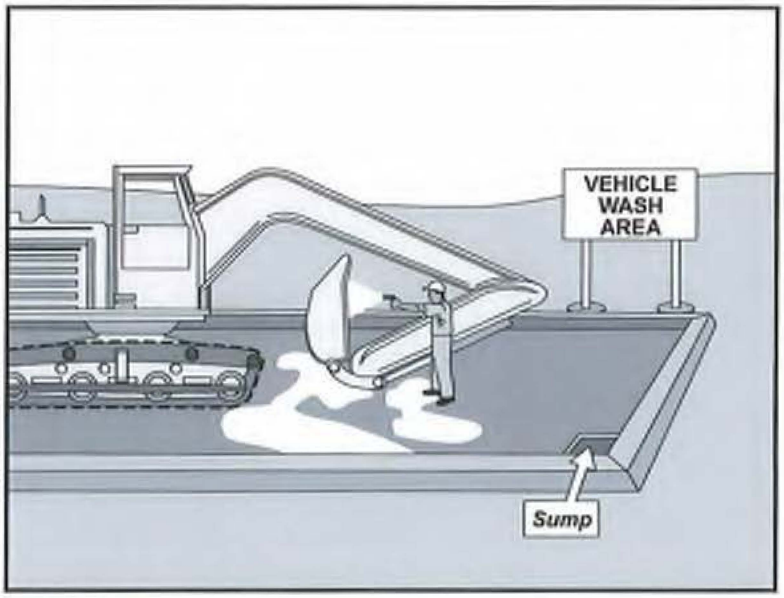
References

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.

Vehicle and Equipment Cleaning NS-8



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 User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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:

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- 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

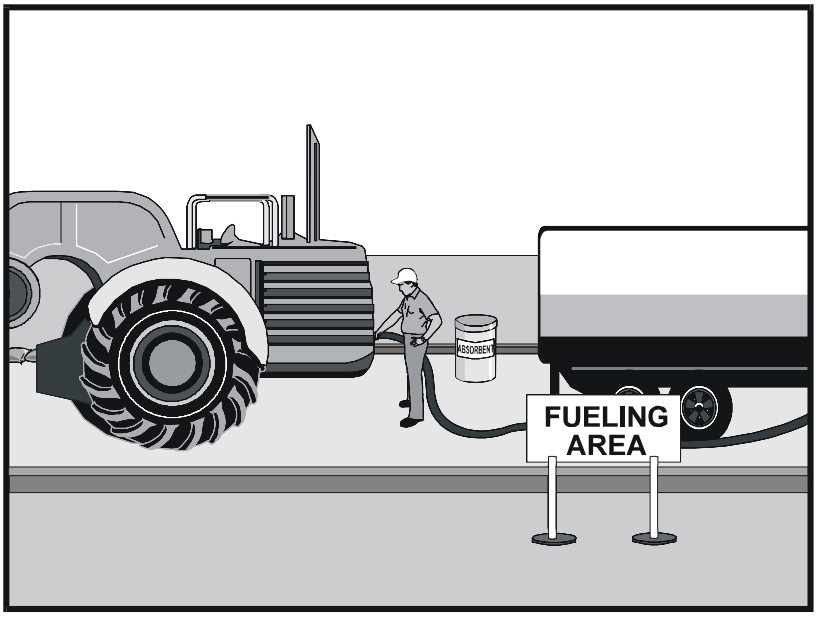
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at 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.
- 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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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

- Inspect BMPs 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.
- 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

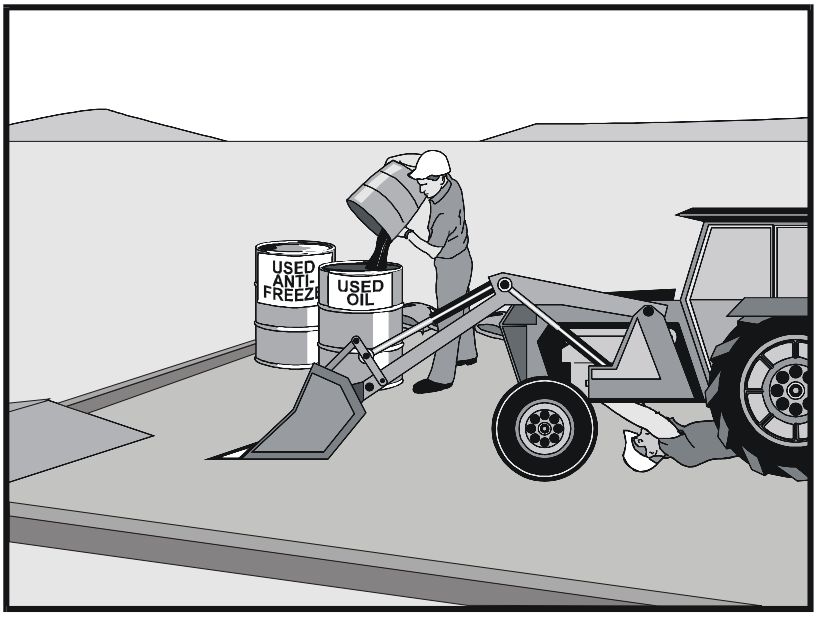
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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



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 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 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 BMPs 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.
- 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.

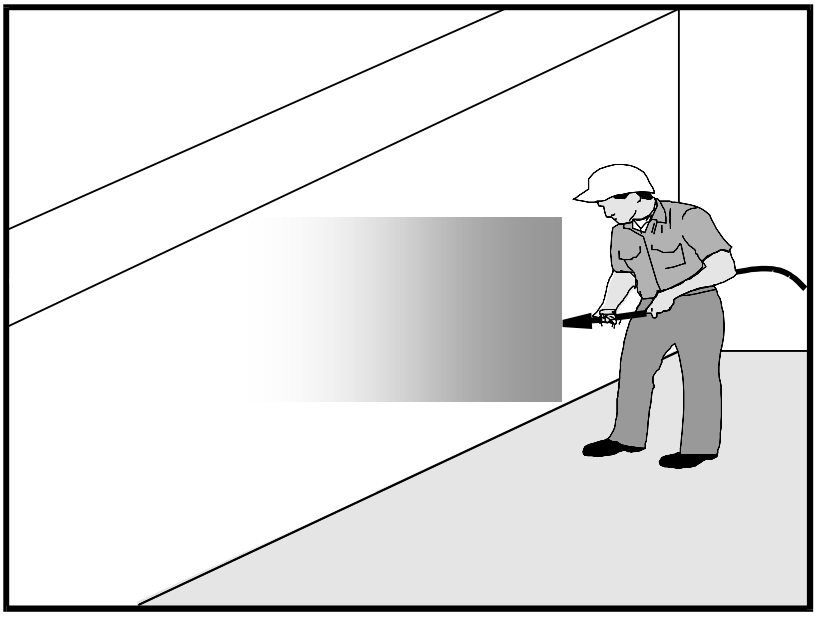
References

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.

Concrete Curing NS-12



Categories		
EC	Erosion Control	
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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

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 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

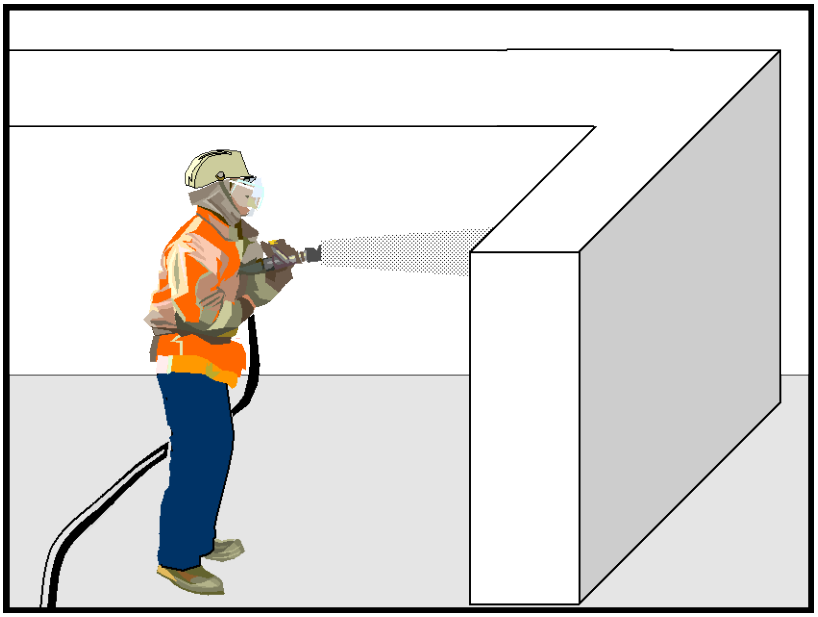
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

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



Categories

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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

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

Potential Alternatives

None

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 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.

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.

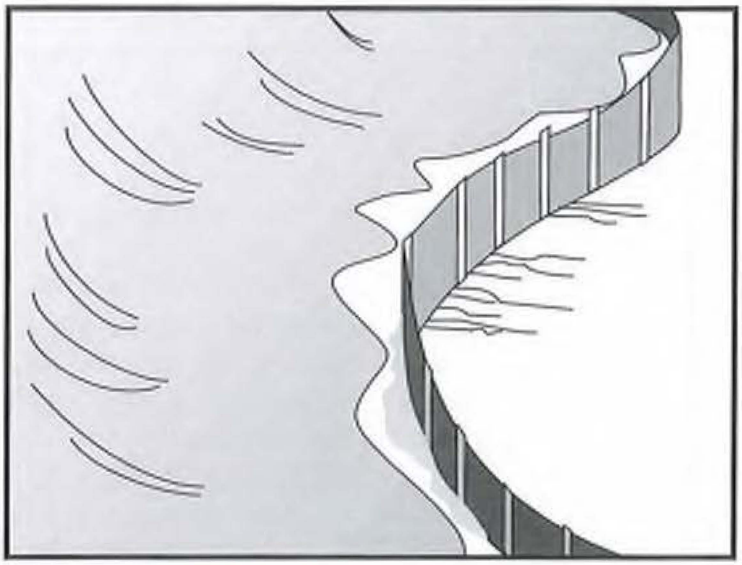
References

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.

Silt Fence SE-1



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

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 water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

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 should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At 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.

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

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.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- 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 coarse sediment by intercepting and detaining 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:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- 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.
- 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.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt 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 draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- 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

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden 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 instead of wood stakes.

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 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 geotextile 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).
    - Minimal soil disturbance.
    - Better level of compaction along fence, less susceptible to undercutting
    - Uniform installation.
- Limitations:
    - Does not work in shallow or rocky soils.
    - Complete removal of geotextile material after use is difficult.
    - Be cautious when digging near potential underground utilities.

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.

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 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient 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.

References

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

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

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

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

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

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

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

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

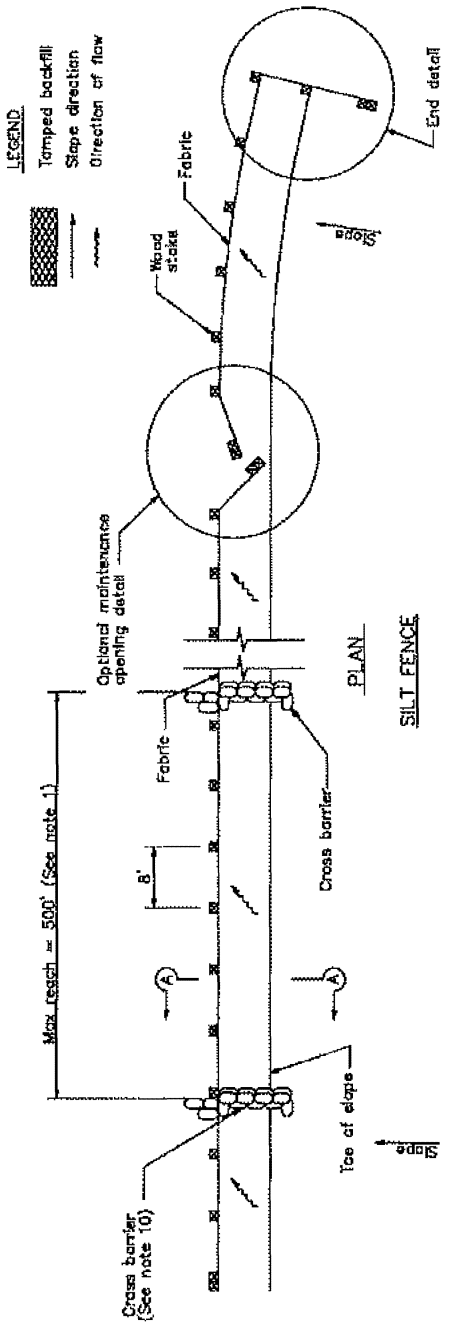
U.S. Environmental Protection Agency (USEPA). Stormwater Best Management Practices: Silt Fences. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 2012.

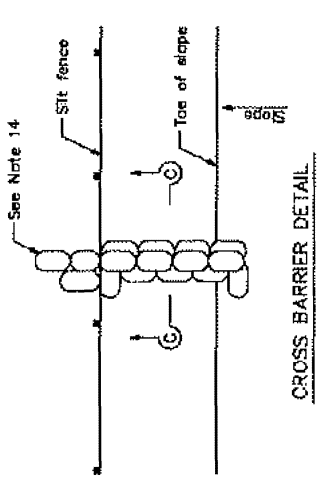
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

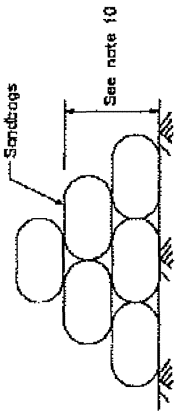
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

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.

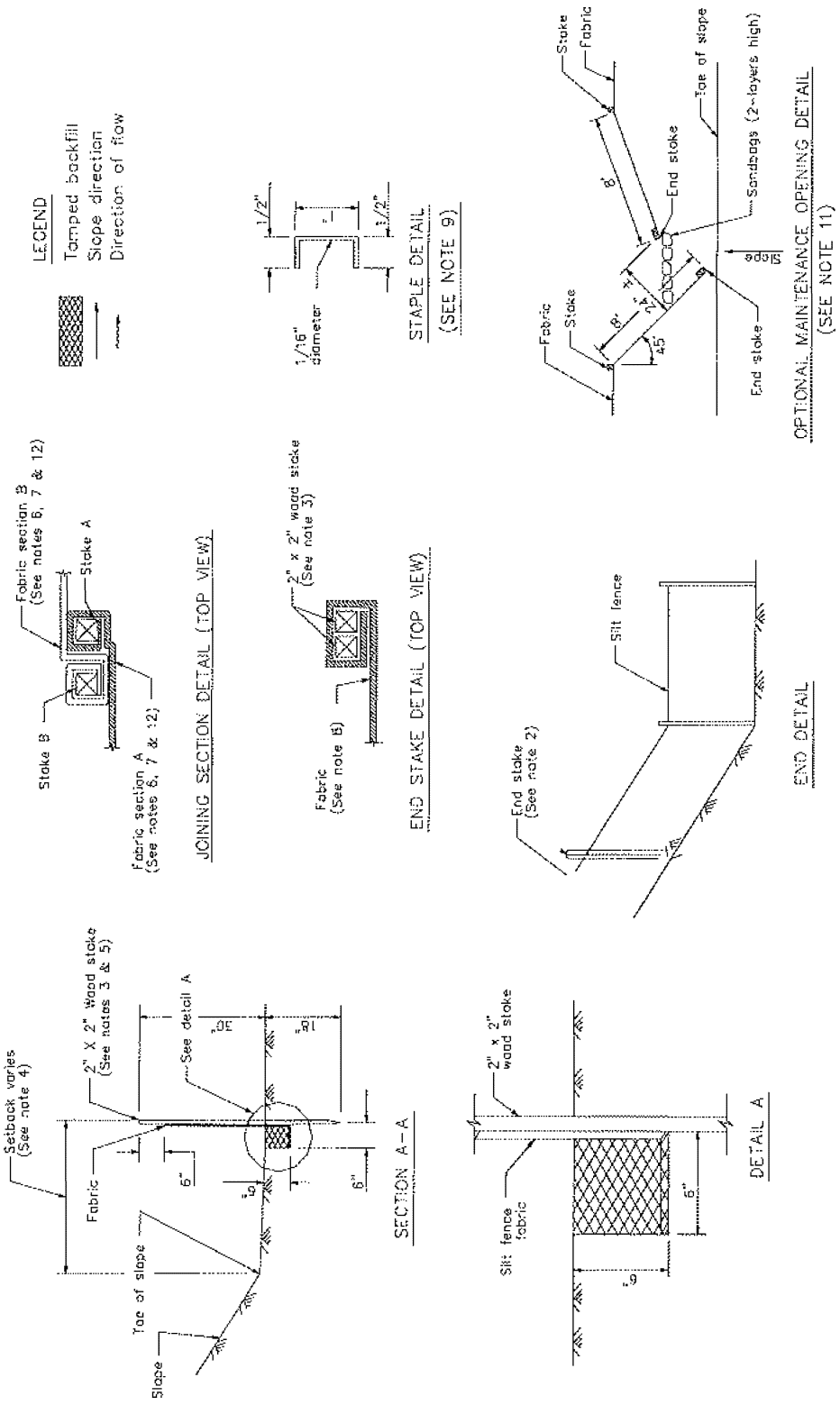


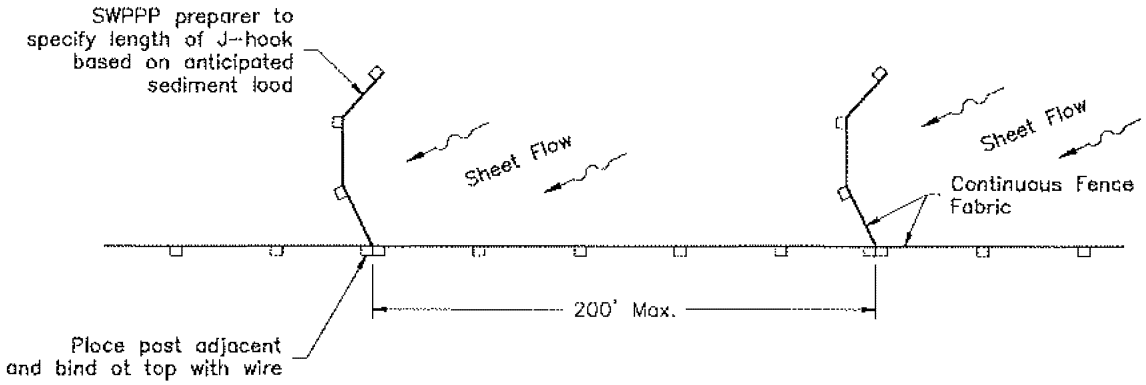




NOTES

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 field 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.

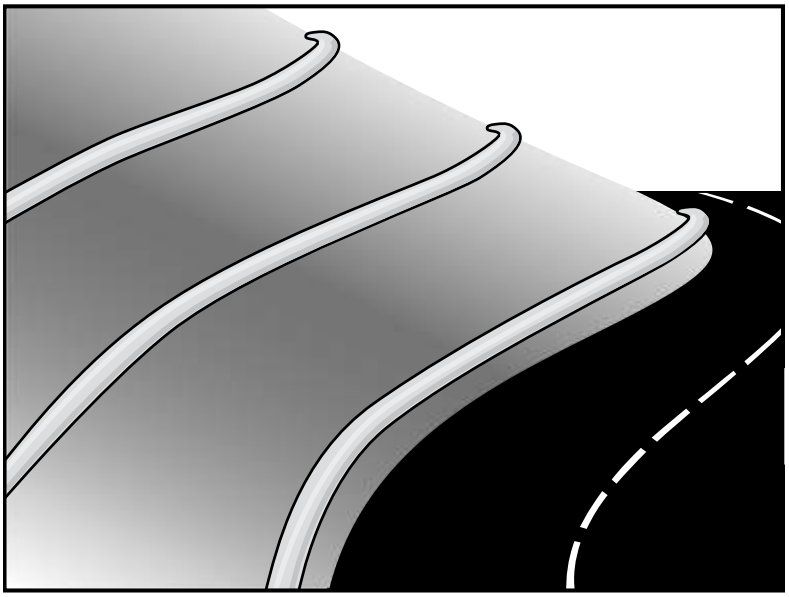

LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1/16" diameter
1/2"
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
8'
End stake
Toe of slope
Sandbags (2-layers high)
Fabric
Stake
8'
4'
45°
Edge
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Fabric section B
(See notes 6, 7 & 12)
Stake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


SWPPP preparer to specify length of J-hook based on anticipated sediment load
Sheet Flow
Sheet Flow
Continuous Fence Fabric
200' Max.
Place post adjacent and bind at top with wire

Plan

J-HOOK

Fiber Rolls SE-5



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

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.

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-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

- 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

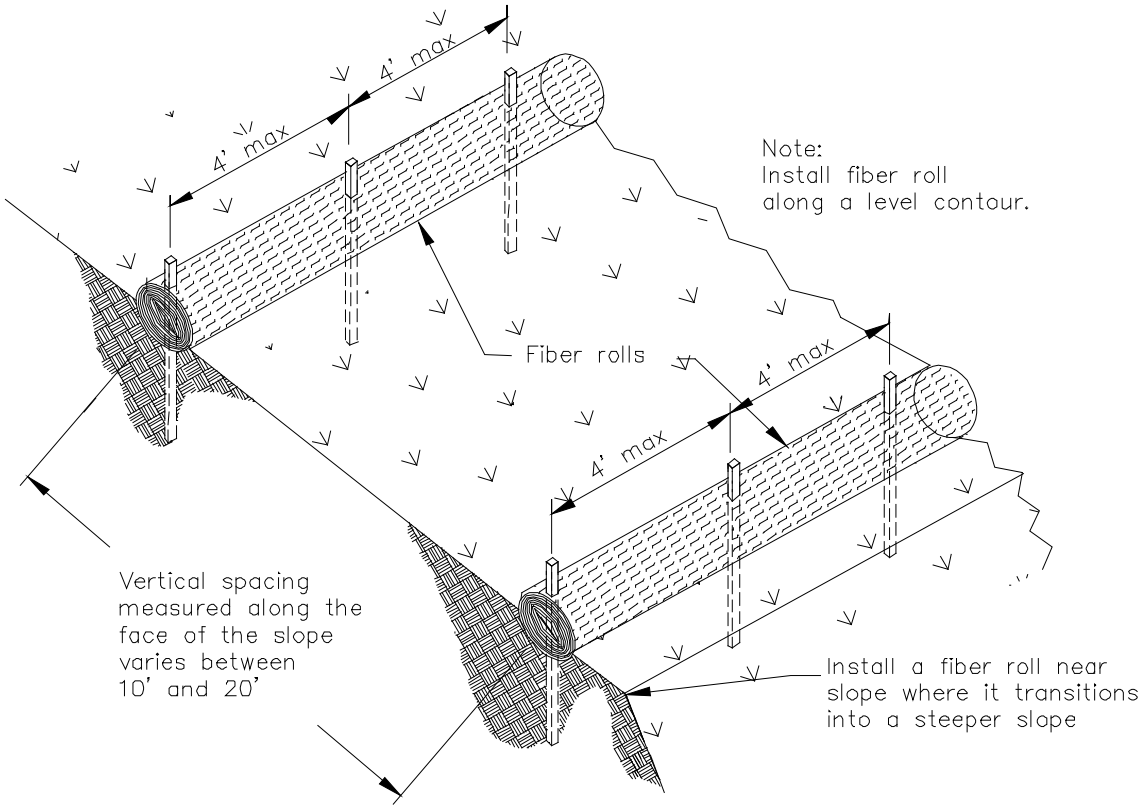
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- 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.

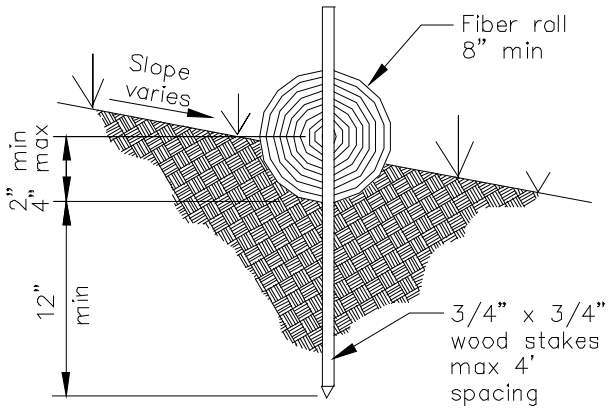
References

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.

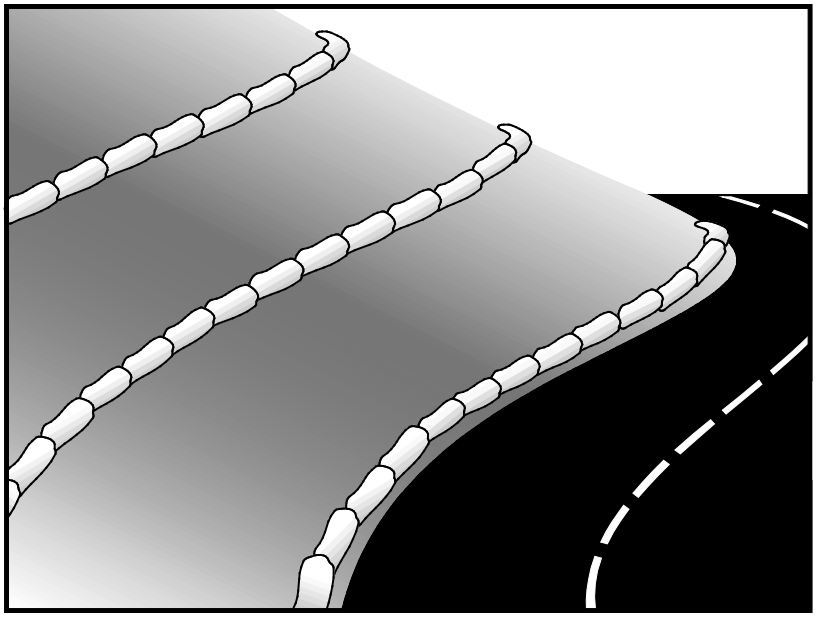


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



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.

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-12 Temporary Silt Dike

SE-14 Biofilter Bags

- 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.

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

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

Costs

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

Inspection and Maintenance

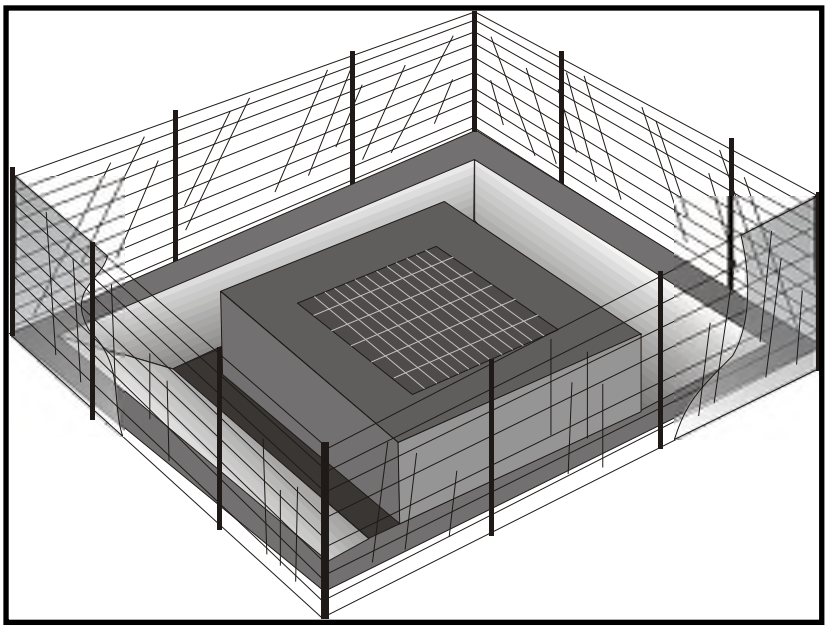
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in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

Storm Drain Inlet Protection SE-10



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

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

SE-13 Compost Socks and Berms

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.
- Seven 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.

- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 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.

- ***DI Protection Type 7 – Compost Socks*** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

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.
- See SE-13 for Compost Sock cost information.

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.

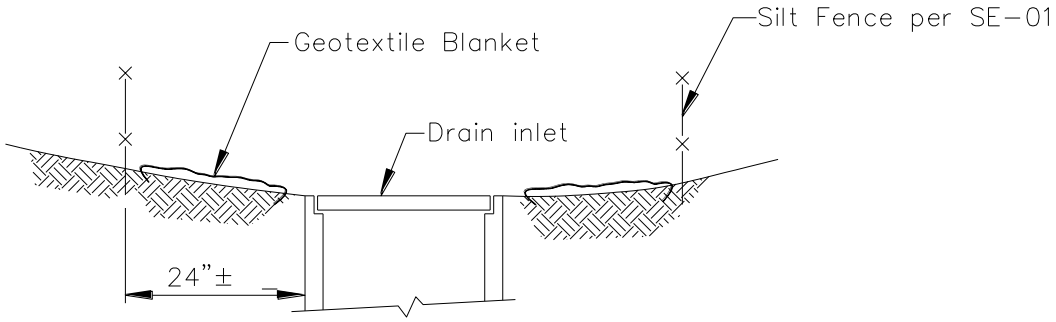
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- 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

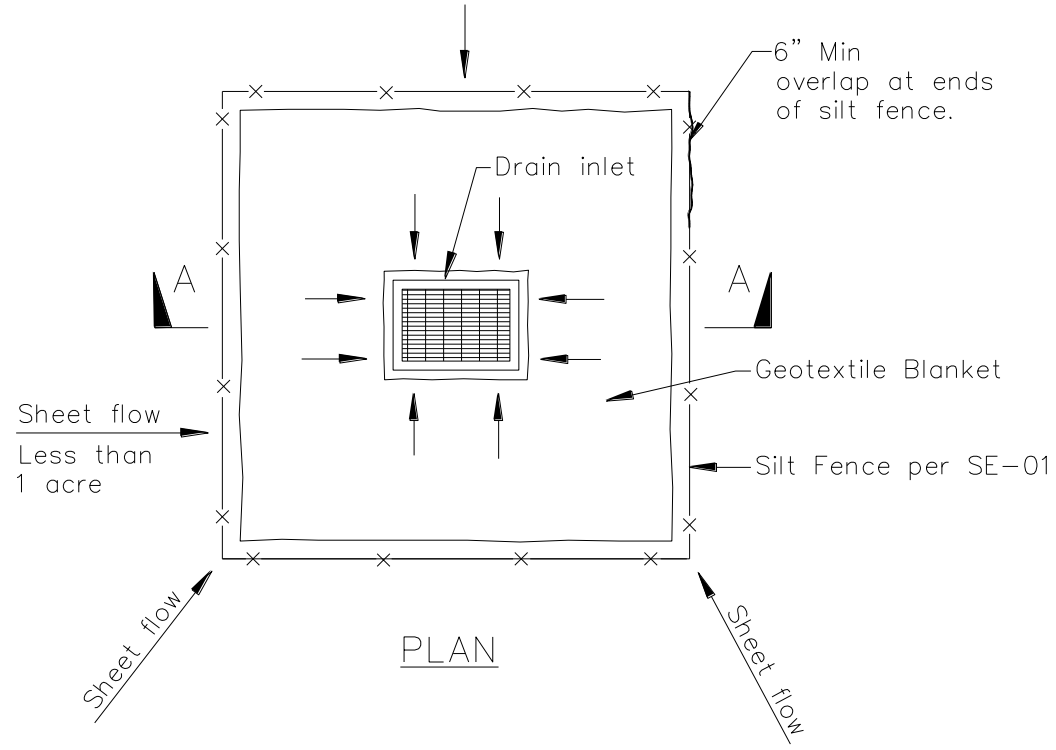
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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.



SECTION A–A

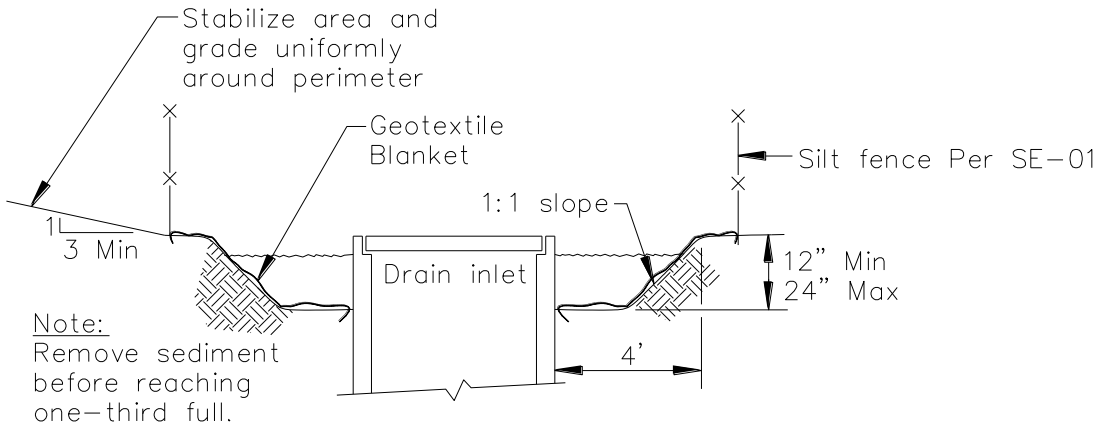


PLAN

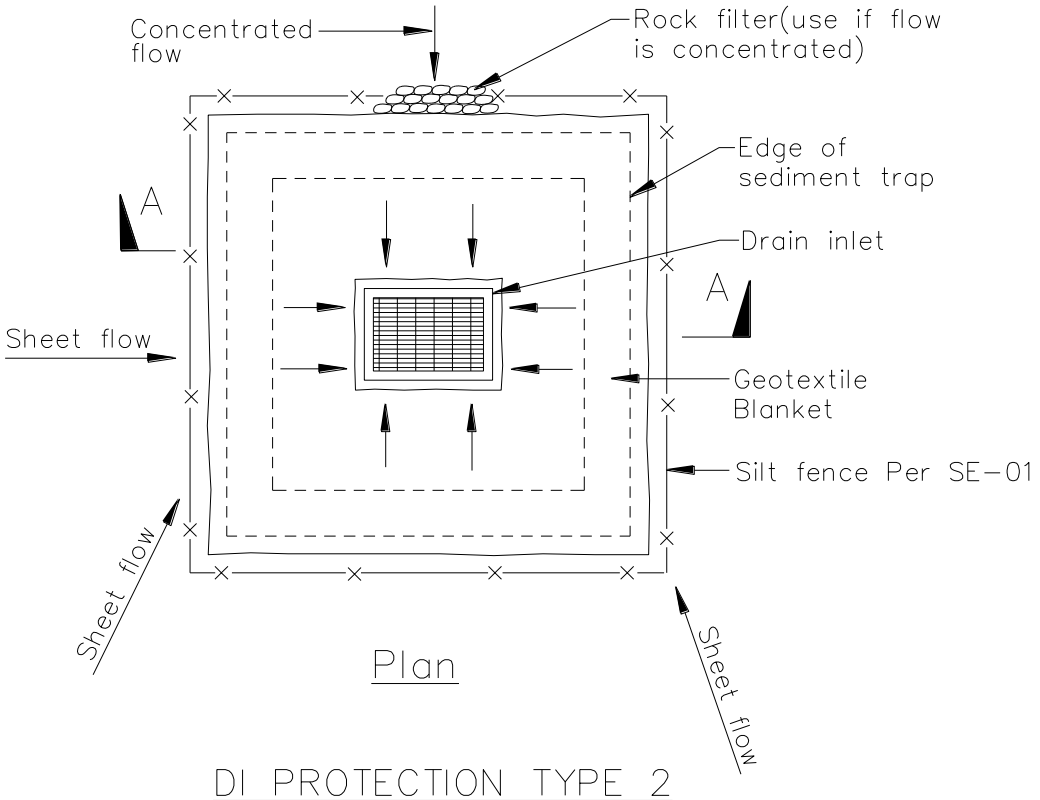
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



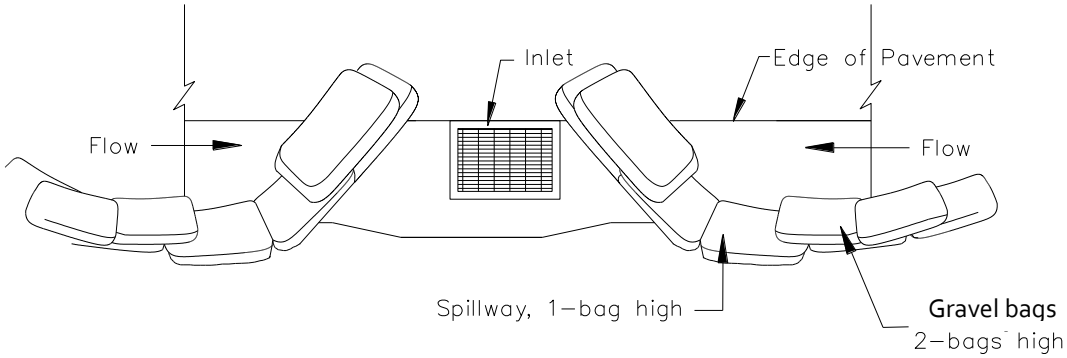
Section A–A



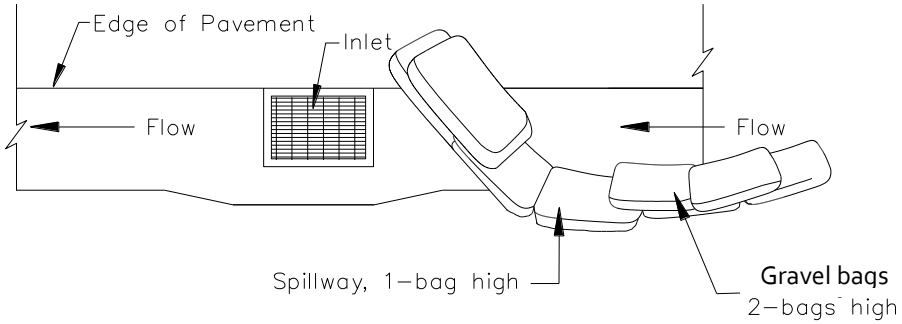
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

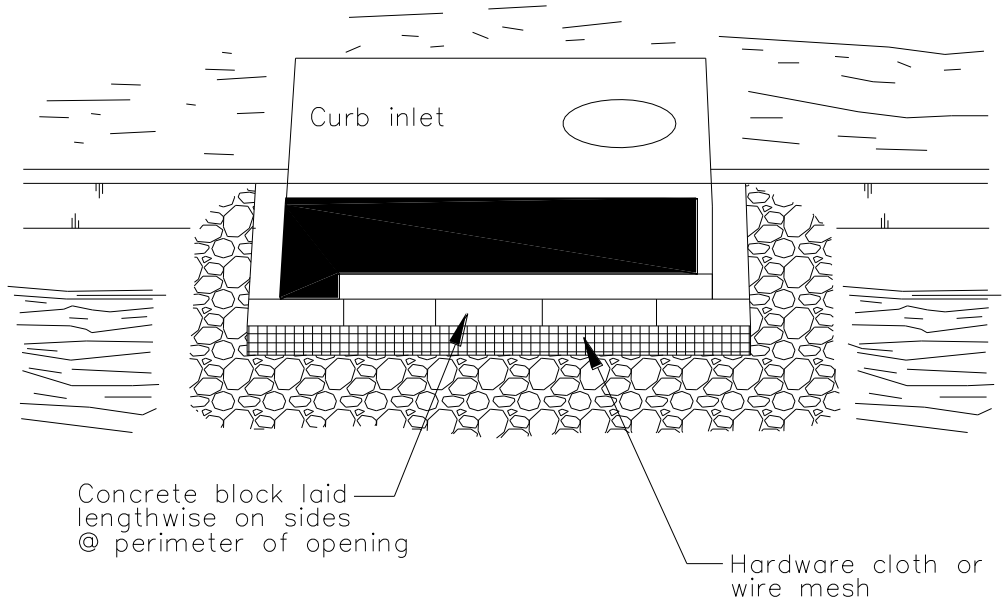


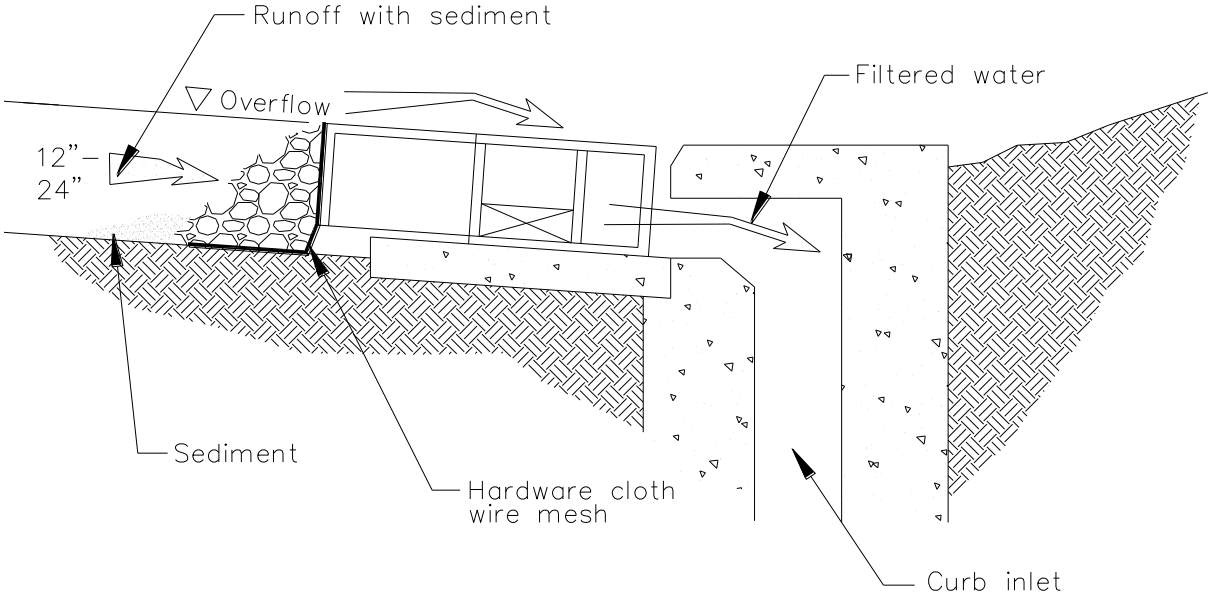
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4

NOT TO SCALE

Manufactured Linear Sediment Controls (MLSC) SE-12




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-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

Manufactured linear sediment controls (MLSC) are pre-manufactured devices that are typically specified and installed for drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels. Typically, MLSCs can be reused.

This fact sheet is intended to provide guidance on BMP selection and implementation of proprietary or vendor-supplied products, for sediment control. Products should be evaluated for project-specific implementation and used if determined to be appropriate by the SWPPP Preparer.

Suitable Applications

MLSCs are generally used in areas as a substitute for fiber rolls and silt fences in sediment control applications to slow down runoff water, divert drainage or contain fines and sediment. MLSCs are a linear control and application suitability varies based on the specific product type. They may be suitable:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.

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- 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.

Limitations

- Limitations vary by product. Product manufacturer's printed product use instructions should be reviewed by the SWPPP Preparer to determine the project-specific applicability of MLSCs.

Implementation

General

When appropriately placed, MLSCs intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The device is porous, which allows the ponded runoff to flow slowly through the device, releasing the runoff as sheet flows. Generally, MLSCs should be used in conjunction with temporary soil stabilization controls up-slope to provide an effective combination of erosion and sediment control.

Design and Layout

- MLSCs used on soil should be trenched or attached to the ground per manufacturer specifications in a manner that precludes runoff or ponded water from flowing around or under the device.
- MLSCs designed for use on asphalt or concrete may be attached using a variety of methods, including nailing the device to the pavement, or using a high strength adhesive.
- Follow manufacturer written specifications when installing MLSCs.
- Allow sufficient space up-slope from the silt dike to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, MLSCs should be set back 3 feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the sediment control may be constructed on the toe of the slope. To prevent flows behind the barrier, sand or gravel bags can be placed perpendicular and between the sediment control and slope to serve as a barrier to parallel flow.
- Drainage area should not exceed 5 acres.

Materials

- Several manufactured products are available. The following search terms or combination of terms can be used with an internet search engine to find manufactured linear sediment controls:

- "silt barrier"
- "reusable silt fence"
- "silt fence alternative" or
- "perimeter sediment control"

Costs

Manufacturers should be contacted directly for current pricing.

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.
- Reshape or replace sections of damaged MLSCs 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 MLSCs 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

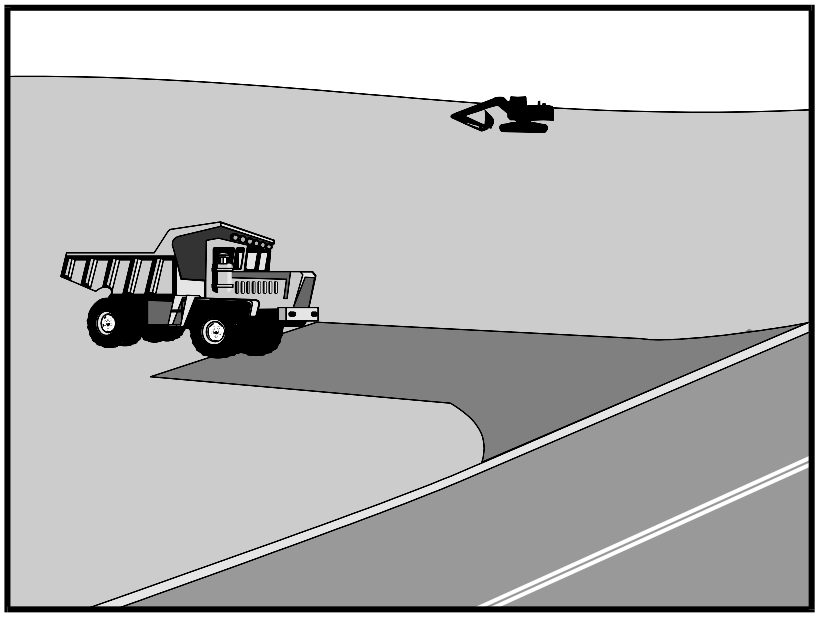
City of Elko Construction Site Best Management Practices Handbook, December 2005.

Construction Site Best Management Practices Handbook, June 2008 Update, Truckee Meadows Regional Stormwater Quality Management Program, June 2008.

Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices, Texas Commission on Environmental Quality, Revised July 2005, Addendum Sheet, January26, 2011.

Stormwater Management Manual for Western Washington Volume II, Construction Stormwater Pollution Prevention, Washington State Department of Ecology, February 2005.

Stabilized Construction Entrance / Exit TC-1



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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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 or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- 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 BMPs 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 local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

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

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

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

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

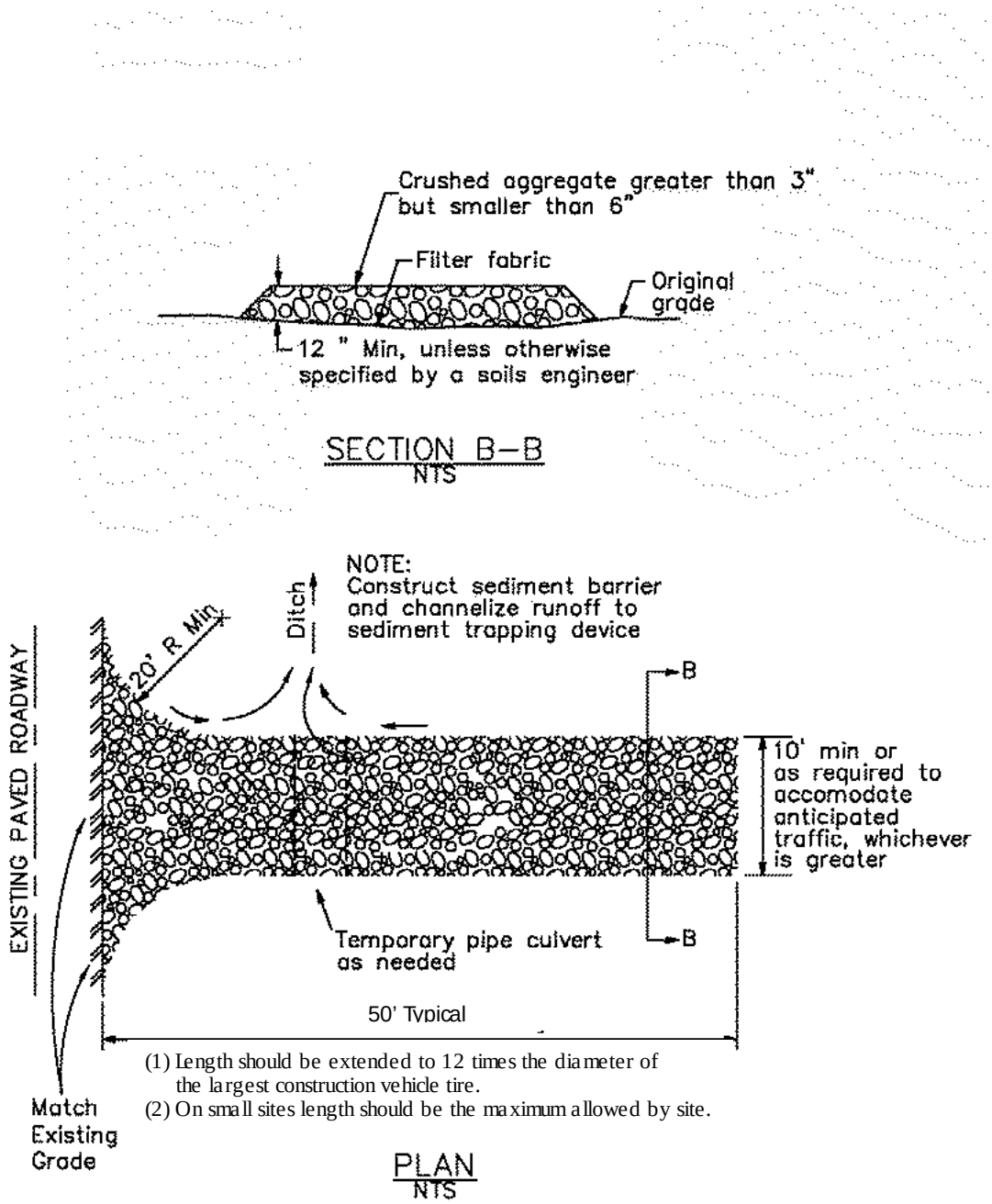
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

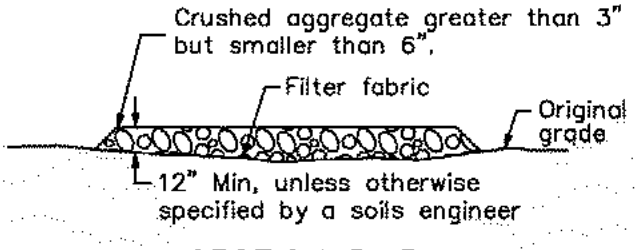
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

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

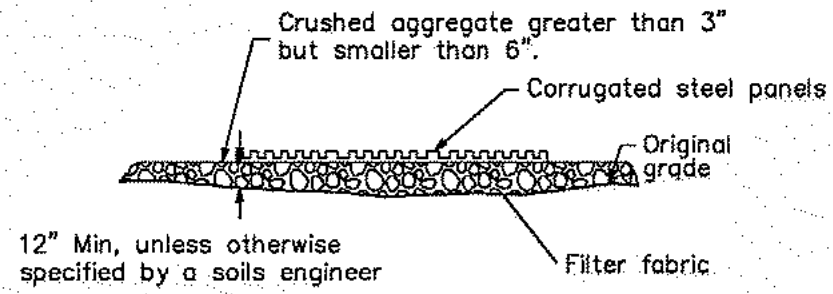
Stabilized Construction Entrance / Exit TC-1



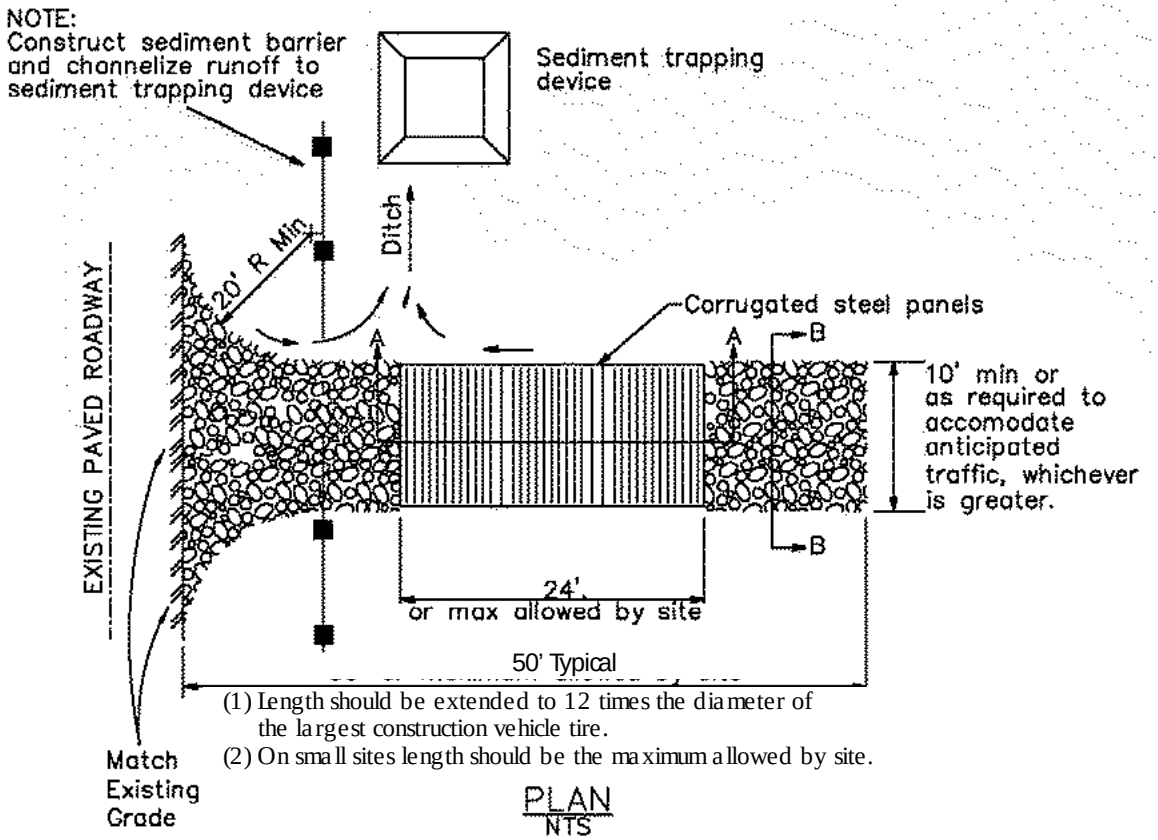
Stabilized Construction Entrance / Exit TC-1



SECTION B–B
NTS



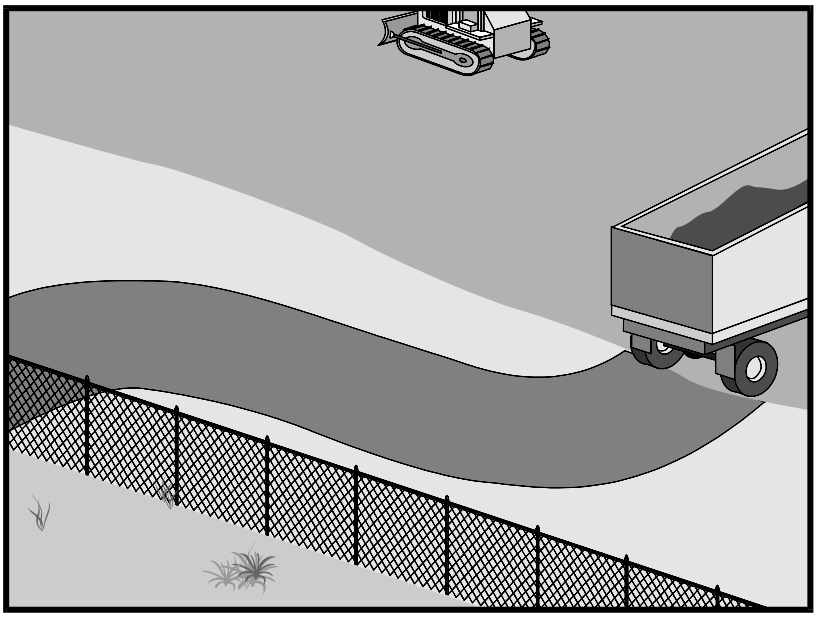
SECTION A–A
NOT TO SCALE



(1) Length should be extended to 12 times the diameter of the largest construction vehicle tire.
(2) On small sites length should be the maximum allowed by site.

PLAN
NTS

Stabilized Construction Roadway TC-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

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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.
- 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, inspect BMPs 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 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.

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

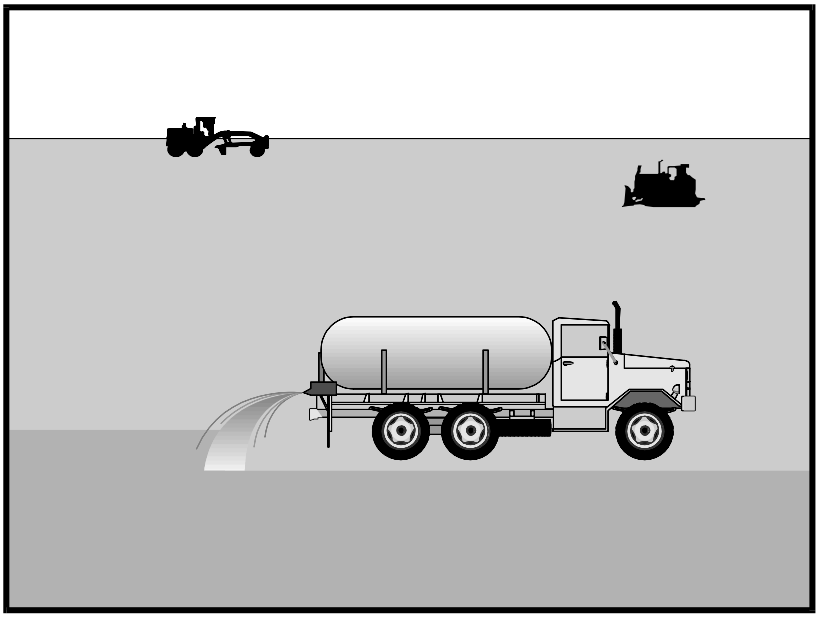
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

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.

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

Wind Erosion Control WE-1



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.

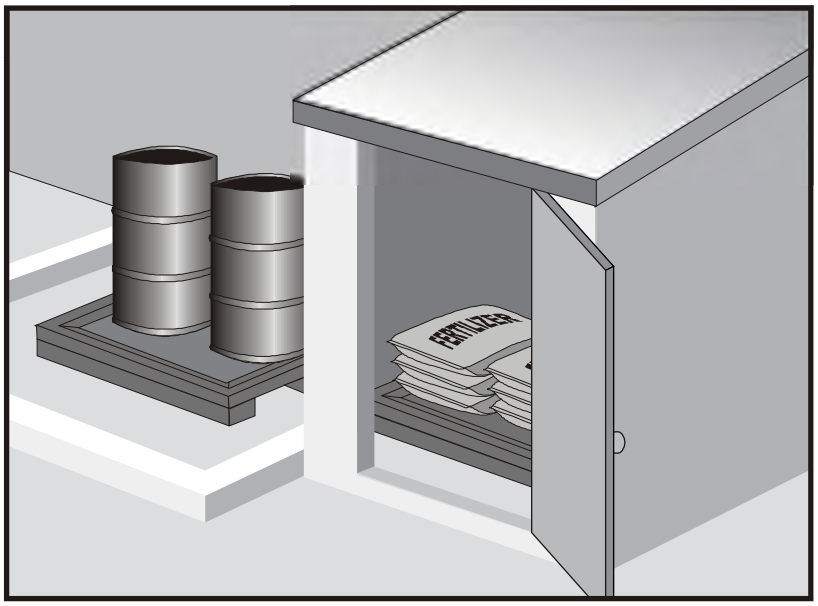
California Air Pollution Control Laws, California Air Resources Board, updated annually.

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.

Material Delivery and Storage WM-1



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

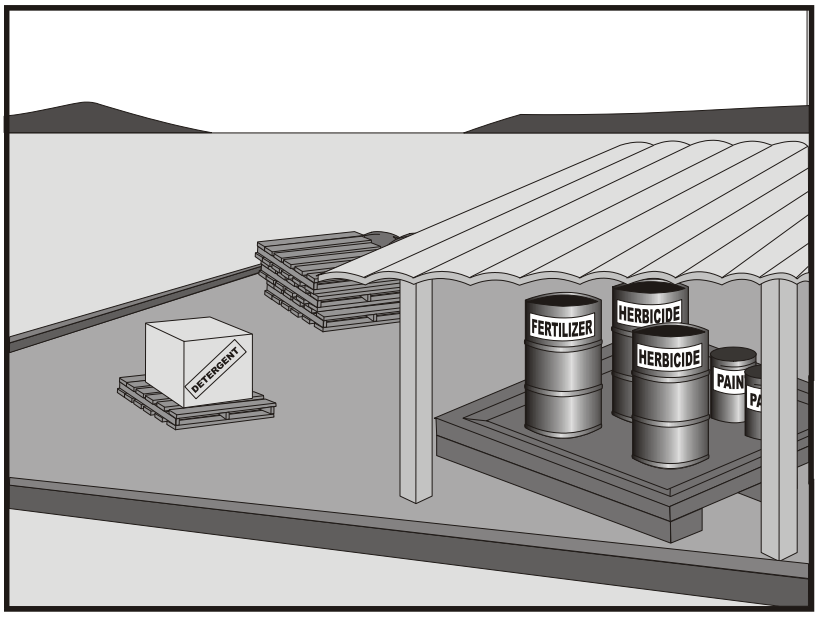
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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



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

Categories

EC	Erosion Control	
SE	Sediment Control	
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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

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.

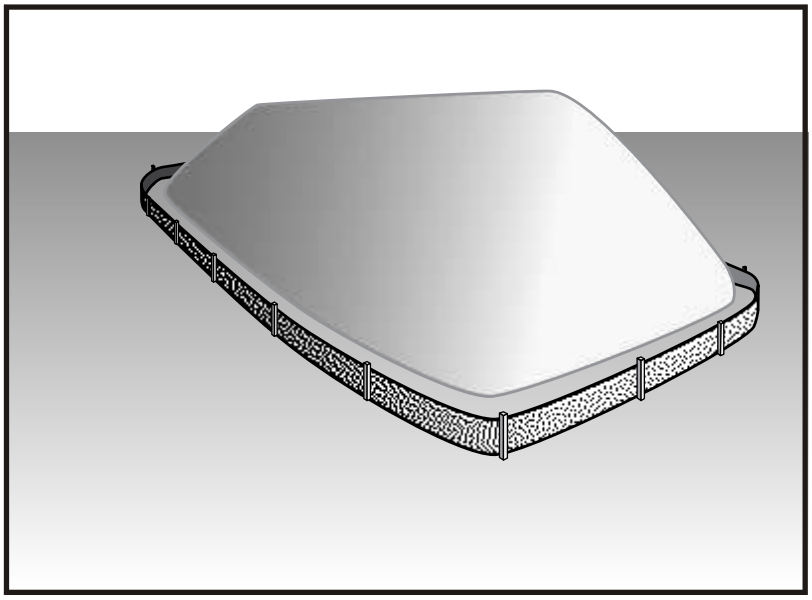
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

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.

Stockpile Management WM-3



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.
- After 14 days of inactivity, a stockpile is non-active and requires further protection described below. All stockpiles are required to be protected as non-active stockpiles 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

A stockpile is considered non-active if it either is not used for 14 days or if it is scheduled not to be used for 14 days or more. Stockpiles need to be protected immediately if they are not scheduled to be used within 14 days. Non-active stockpiles of the identified materials should be protected 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

A stockpile is active when it is being used or is scheduled to be used within 14 days of the previous use. 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.)

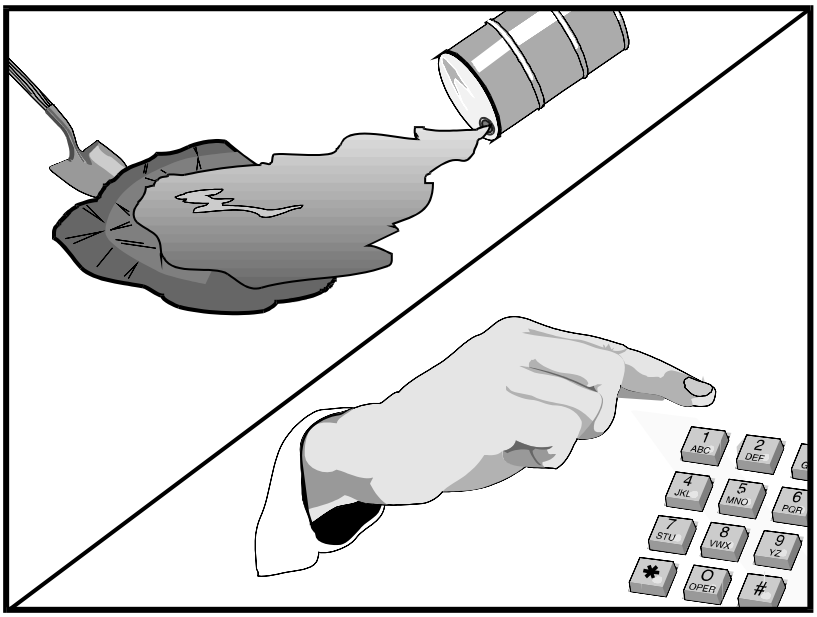
Inspection and Maintenance

- 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.

Spill Prevention and Control WM-4



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

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

- 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 BMPs 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.
- 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.

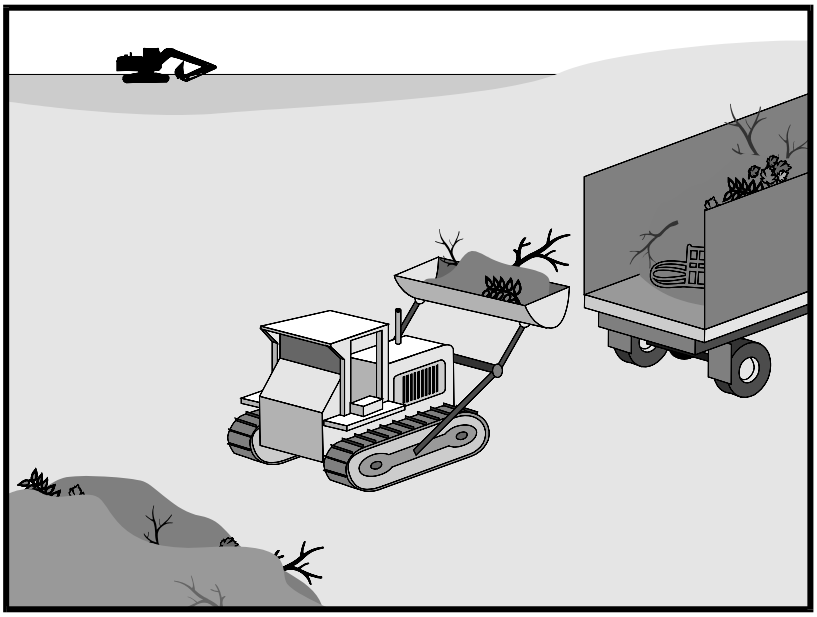
References

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.

Solid Waste Management WM-5



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

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, 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.
- Cover waste containers at the end of each work day and when it is raining.
- 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 BMPs 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

- Inspect construction waste area regularly.

- Arrange for regular waste collection.

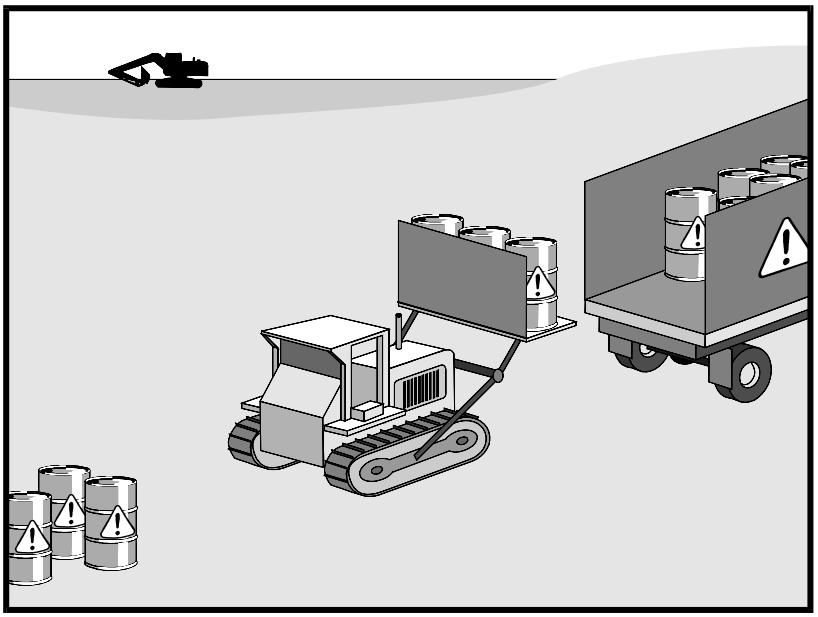
References

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	
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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 User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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

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 BMPs 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
- 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

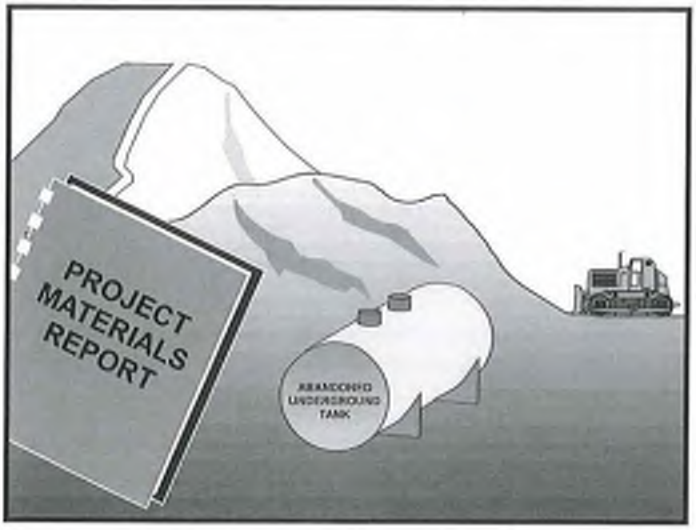
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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.

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**

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

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

Potential Alternatives

None

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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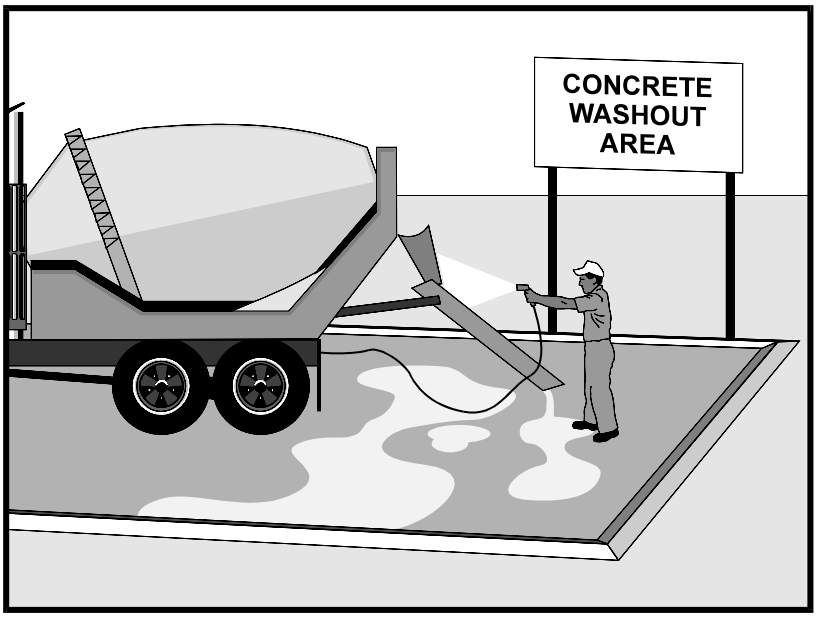
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



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 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.
  - Washouts shall be implemented in a manner that prevents leaching to underlying soils. Washout containers must be water tight and washouts on or in the ground must be lined with a suitable impervious liner, typically a plastic type material.
- 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.

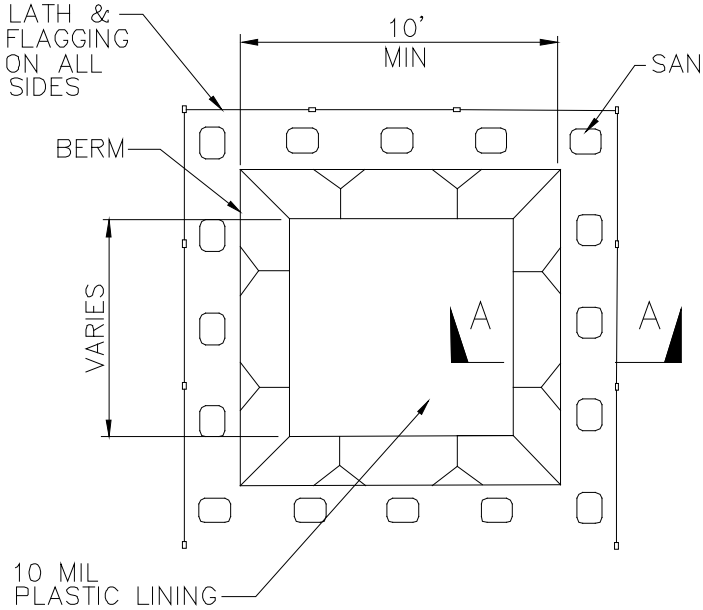
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

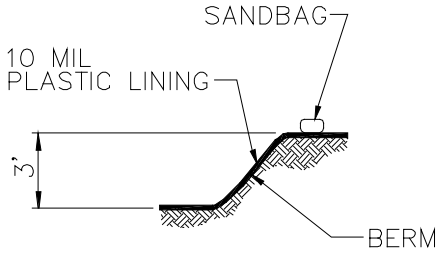
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

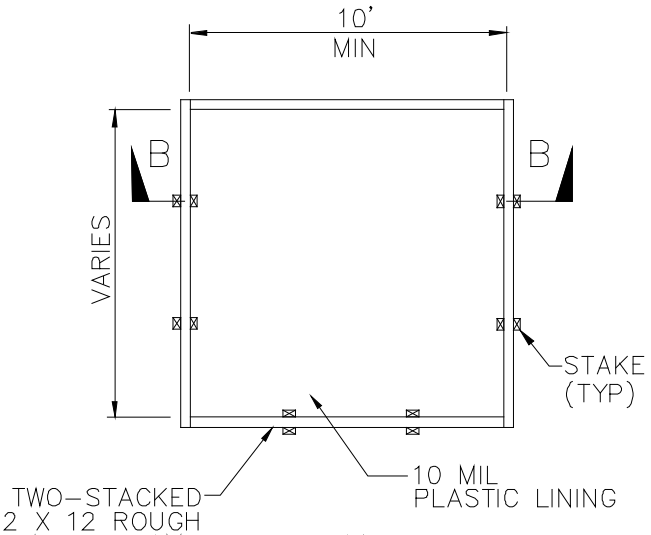
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



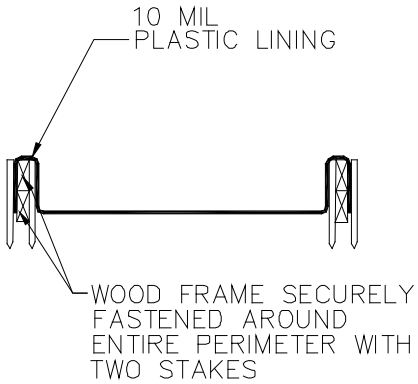
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



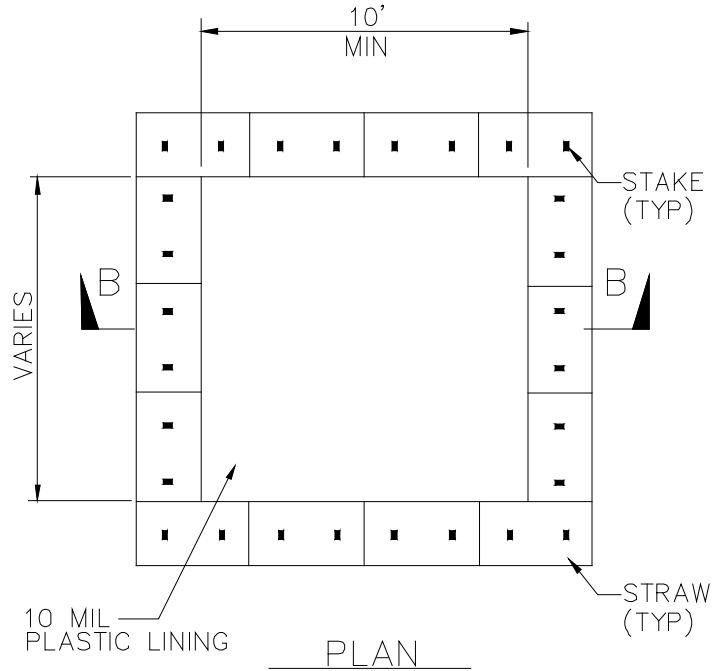
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



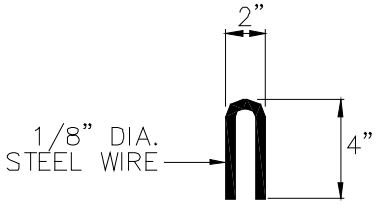
SECTION B–B
NOT TO SCALE

NOTES

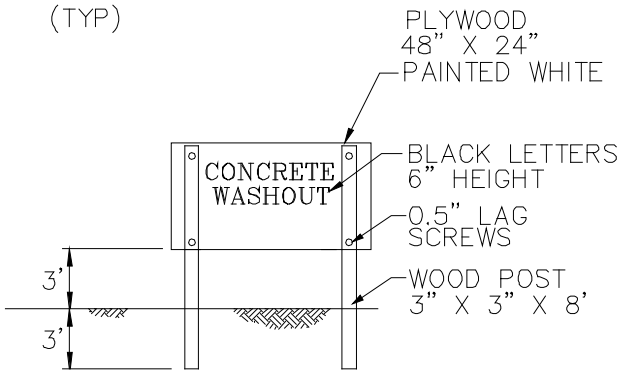
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



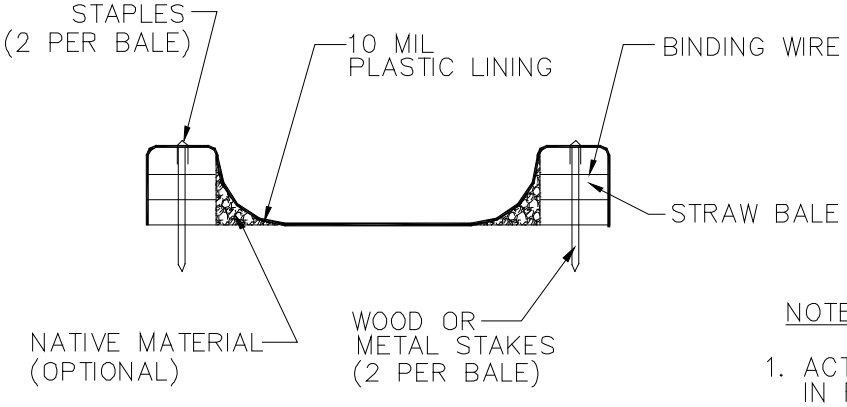
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

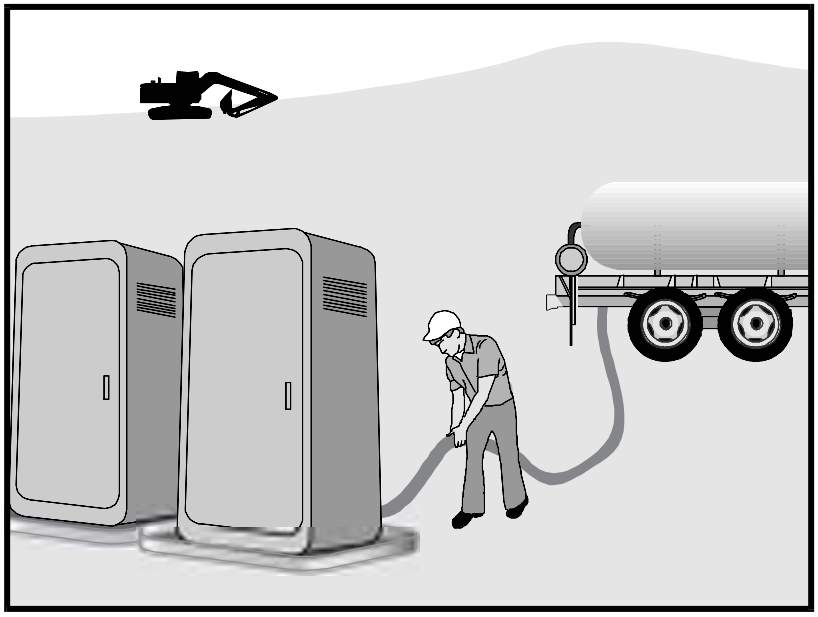


SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



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

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

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.

- 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.

APPENDIX I – BMP INSPECTION FORMS

BMP INSPECTION REPORT

Encina Power Station Demolition

Carlsbad, CA

Date and Time of Inspection:			Date Report Written:	
Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm *Complete Parts I,II,III,VI and VII*

Part I. General Information

Site Information

Construction Site Name:	
Construction stage and completed activities:	Approximate area of site that is exposed:

Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)

Is a “Qualifying Event” predicted or did one occur (i.e., 0.5” rain with 48-hrs or greater between events)? (Y/N)
If yes, summarize forecast:

Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Part II. BMP Observations. **Describe deficiencies in Part III.**			
Minimum BMPs for Risk Level 2 Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level 2 Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies		
Deficiency	**Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.**	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. **Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).**	
	Yes, No, N/A
Do stormwater storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are stormwater storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

Part V. Additional During Storm Observations. **If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.**	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-Storm Observations. **Visually observe (inspect) stormwater discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.**	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. **Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.**	
Required Actions	**Implementation Date**

APPENDIX J – ENDANGERED SPECIES

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

San Diego County, California

Local office

Carlsbad Fish And Wildlife Office

(760) 431-9440
(760) 431-5901

2177 Salk Avenue - Suite 250
Carlsbad, CA 92008-7385

http://www.fws.gov/carlsbad/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Pacific Pocket Mouse Perognathus longimembris pacificus — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8080

Stephens' Kangaroo Rat Dipodomys stephensi (incl. D. cascus) — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/3495

Birds

NAME	STATUS

California Least Tern Sterna antillarum browni — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8104

Coastal California Gnatcatcher Polioptila californica californica — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8178

Least Bell's Vireo Vireo bellii pusillus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5945

Light-footed Clapper Rail Rallus longirostris levipes — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6035

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Western Snowy Plover Charadrius nivosus nivosus — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8035

Amphibians

NAME	STATUS

Arroyo (=arroyo Southwestern) Toad Anaxyrus californicus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/3762

Fishes

NAME	STATUS
Tidewater Goby Eucyclogobius newberryi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/57	Endangered

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp Streptocephalus woottoni There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
San Diego Fairy Shrimp Branchinecta sandiegonensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6945	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
Del Mar Manzanita Arctostaphylos glandulosa ssp. crassifolia No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7673	Endangered
San Diego Ambrosia Ambrosia pumila There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8287	Endangered
San Diego Button-celery Eryngium aristulatum var. parishii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5937	Endangered
San Diego Thornmint Acanthomintha ilicifolia There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/351	Threatened

Spreading Navarretia Navarretia fossalis — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1334

Thread-leaved Brodiaea Brodiaea filifolia — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6087

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip:

enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black Turnstone Arenaria melanocephala This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

Willet Tringa semipalmata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

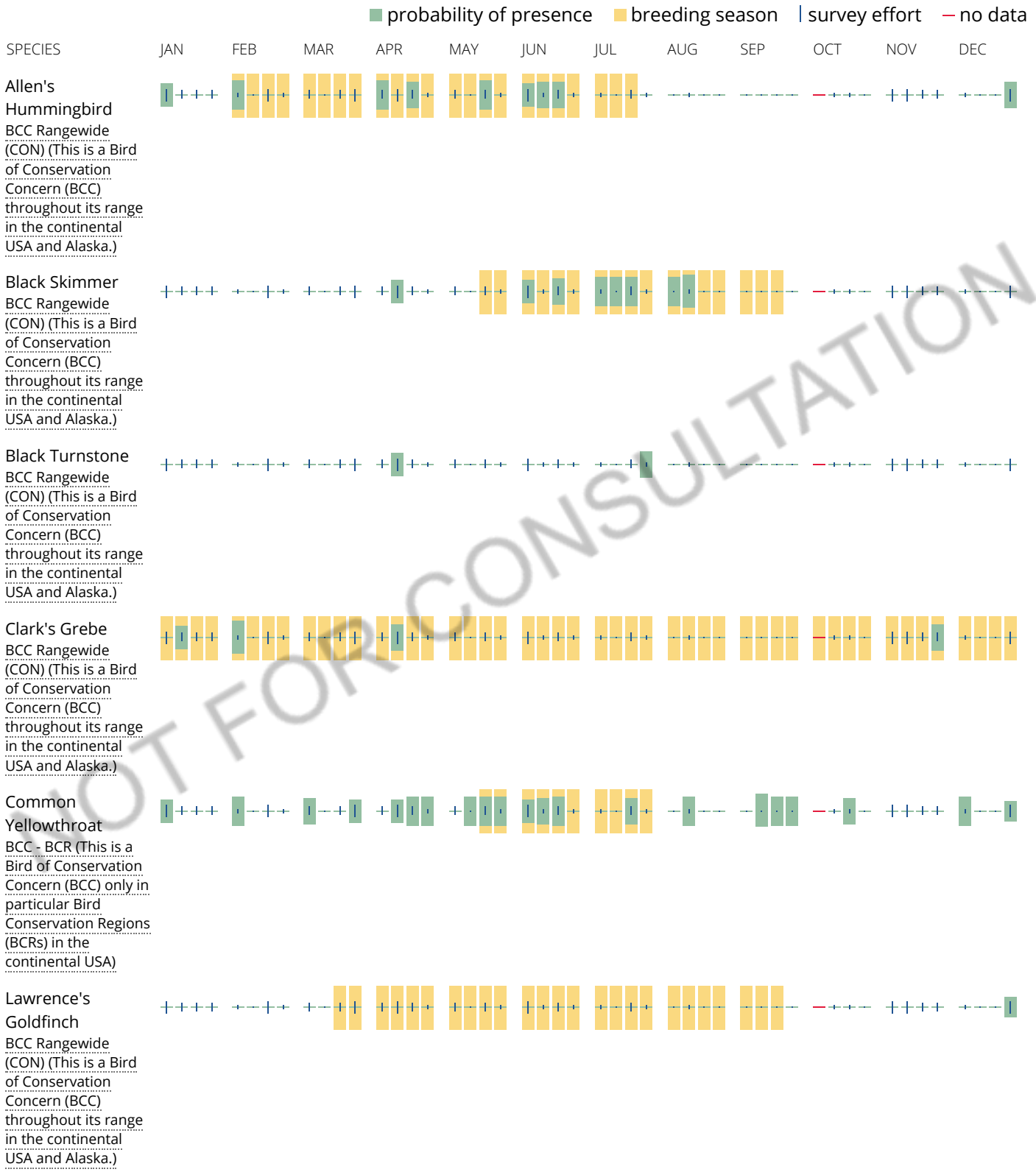
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

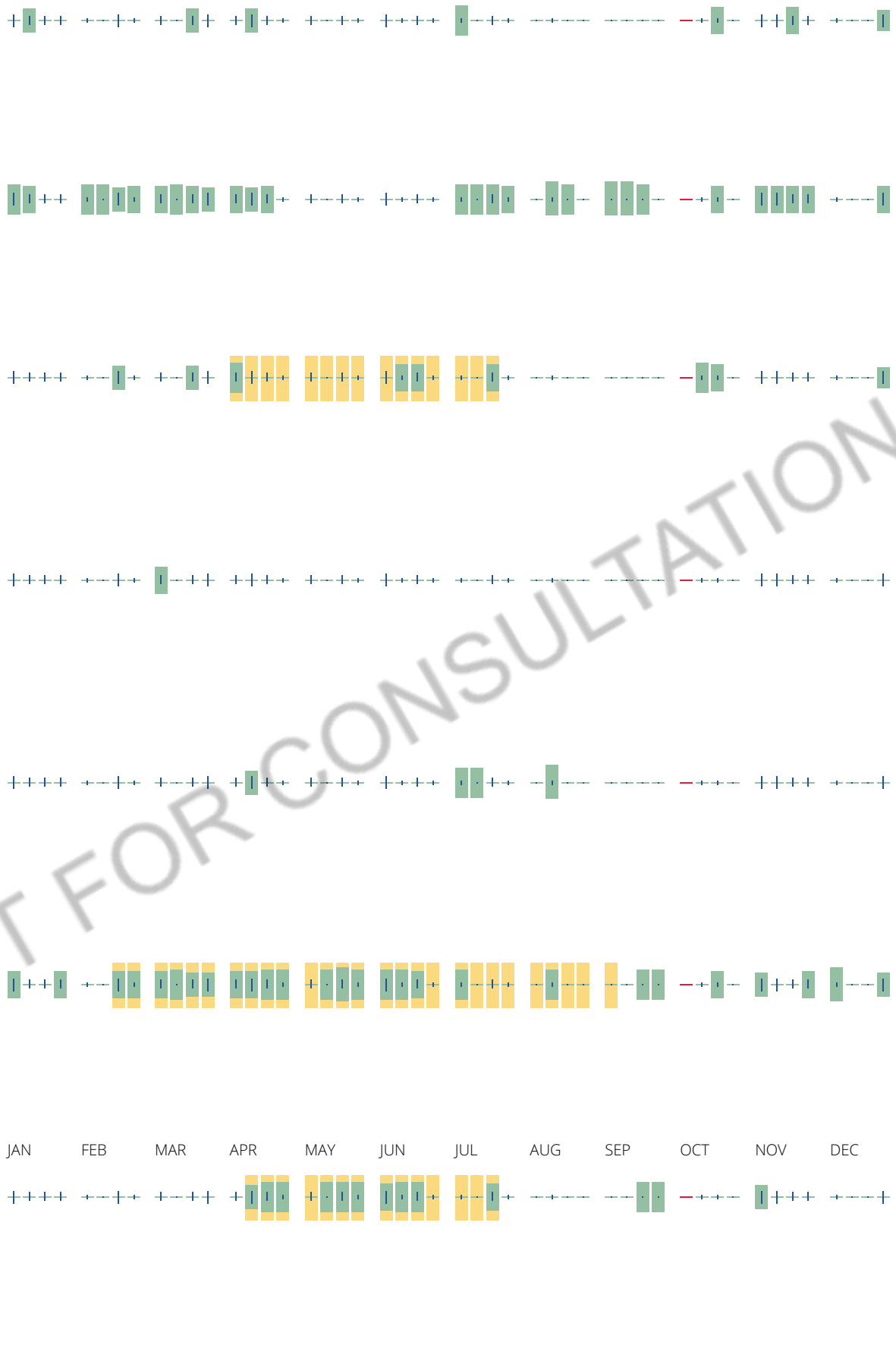
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

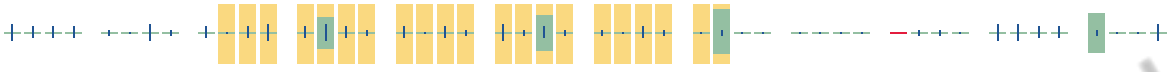




Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look

carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1Cx

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX K – TRAINING REPORTING FORM

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: EPS Demolition Project

WDID #: 9 37C88251

Stormwater Management Topic: (check as appropriate)

☐ Erosion Control ☐ Sediment Control

☐ Wind Erosion Control ☐ Tracking Control

☐ Non-Stormwater Management ☐ Waste Management and Materials Pollution Control

☐ Stormwater Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor:_____ Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

EMILY RIVERAMELO

Nov 12, 2018 - Nov 12, 2020

Certificate # 26945

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Simon Barber

Nov 05, 2018 - Jan 26, 2021

Certificate # 23921

CASQA

California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

William Salisbury

Dec 22, 2017 - Dec 22, 2019

Certificate # 26578

CASQA

California Stormwater Quality Association and
California Construction General Permit Training Team

APPENDIX L – RESPONSIBLE PARTIES

Authorization of Approved Signatories

Project Name: EPS Demolition Project

WDID #: 9 37C88251

Name of Personnel	Project Role	Company	Signature	Date

_____ _____

LRP's Signature Date

_____ _____

LRP Name and Title Telephone Number

Identification of QSP

Project Name: Encina Power Station Demolition

WDID #: 9 37C88251

The following are QSPs associated with this project

Name of Personnel[(1)]	Company	Date
Emily Kochert (Riveramelo), QSP	619-339-6072	ekochert@rinconconsultants.com
Will Salisbury, QSP	916-804-3073	wsalisbury@rinconconsultants.com

(1) If additional QSPs are required on the job site add additional lines and include information here

Authorization of Data Submitters

Project Name: Encina Power Station Demolition

WDID #: 9 37C88251

Name of Personnel	Project Role	Company	Signature	Date
Simon Barber	QSD/P	Burns & McDonnell	Simon Barber	2019-10-02
Timothy Sisk	Manager, Env. Business	NRG Energy	T Sisk	10/2/19

LRP/Approved Signatory's Signature

10/3/2019
Date

Jerry Carter
Approved Signatory

760-268-4011
Telephone Number

APPENDIX M – CONTRACTORS AND SUBCONTRACTORS

Subcontractor Log

Project Name: Encina Power Station Demolition

WDID #: 9 37C88251

The list shall include all Subcontractor names, responsible individuals, telephone numbers, addresses, specific areas of responsibility, and emergency contact numbers.

SUBCONTRACTOR NAME/AREA OF RESPONSIBILITY	CONTACT NAME	ADDRESS	PHONE NUMBER	FIELD EMERGENCY PHONE NUMBER
Civil:				
Mechanical:				
Tanks				
Electrical				
Coatings				

APPENDIX N – CONSTRUCTION GENERAL PERMIT

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.

    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 or in a storage shed (completely enclosed), with appropriate secondary containment to prevent any spillage or leakage.

d. Minimize exposure of construction materials with precipitation.

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 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 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, 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 landscape materials, 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 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, 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 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 Appendix 2.

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 to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

[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.

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 evaluate the quantity and quality of run-on and runoff through observation and sampling. 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 trained to do the task(s) appropriately, but shall ensure adequate deployment.

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 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:** Risk Level 2 dischargers shall 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 chance of producing precipitation in the project area. Risk Level 2 dischargers 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 2 Requirement:** The Risk Level 2 discharger shall develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Post-Construction). Example REAP templates are included in Appendix 3.

3. **Additional Risk Level 2 Requirement:** The Risk Level 2 Discharger shall 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 Risk Level 2 discharger 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 2 Requirement:** The Risk Level 2 discharger shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). An example REAP template is included in Appendix 3. 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:** Risk Level 2 dischargers shall 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:** Risk Level 2 dischargers shall ensure that all REAPs be prepared and certified by a QSP.

8. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall 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	
	Monthly Non-storm Water Discharge	Pre-storm Event		Daily Storm	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 the General Permit (cite Order No.) 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 100 days after [insert adoption date of permit]. 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(s) [responsible party(ies)] 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; and

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. Risk Level 2 dischargers shall take grab samples beginning the first hour of any new discharge and during the first and last hour of every day of normal operations for the duration of the discharge event.

c. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

d. 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).

<u>Storm Water Effluent Monitoring Requirements</u>

e. 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**

[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.

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 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:

[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

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 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, pH test kit, or wide range pH indicator paper. 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 a sample 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**

[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.

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 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 Sedimentation Basin or Project Risk Justification**

Risk Level 2 dischargers utilizing a sediment basin and/or justifying an alternative project risk shall report a soil particle size analysis, using 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 percentage of particles less than 0.02 mm in diameter must also be determined.

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, 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.10 above);

i. Visual observation and sample collection exception records (see Section I.6 above); and

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; and

iii. Description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 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	All	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 portable instrument	For all other than ATS	0	NTU	250 NTU	500 NTU
		For ATS discharges	0	NTU	N/A	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample
SSC	ASTM Method D 3977-97[7]	Risk Level 3 (if NEL exceeded)	5	mg/L	N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[8] fixed-count of 600 org/sample	Risk Level 3 projects> 30 acres	N/A	N/A	N/A	N/A

[7] 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.

[8] 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 1 – CSMP: WEATHER REPORTS

NOAA Atlas 14, Volume 6, Version 2
Location name: Carlsbad, California, USA*
Latitude: 33.1365°, Longitude: -117.3354°
Elevation: 19.21 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.126** (0.106-0.151)	**0.159** (0.134-0.191)	**0.205** (0.172-0.247)	**0.244** (0.203-0.297)	**0.301** (0.241-0.379)	**0.347** (0.272-0.447)	**0.396** (0.302-0.524)	**0.449** (0.333-0.613)	**0.526** (0.373-0.750)	**0.590** (0.403-0.872)
10-min	**0.181** (0.152-0.217)	**0.228** (0.192-0.274)	**0.294** (0.246-0.354)	**0.350** (0.291-0.426)	**0.431** (0.346-0.544)	**0.497** (0.390-0.641)	**0.568** (0.433-0.751)	**0.644** (0.477-0.878)	**0.754** (0.534-1.08)	**0.846** (0.577-1.25)
15-min	**0.218** (0.184-0.262)	**0.276** (0.232-0.332)	**0.356** (0.298-0.429)	**0.424** (0.352-0.515)	**0.522** (0.418-0.658)	**0.601** (0.471-0.775)	**0.686** (0.524-0.908)	**0.779** (0.577-1.06)	**0.912** (0.646-1.30)	**1.02** (0.698-1.51)
30-min	**0.308** (0.259-0.370)	**0.390** (0.327-0.468)	**0.502** (0.421-0.605)	**0.598** (0.497-0.728)	**0.737** (0.590-0.929)	**0.849** (0.665-1.10)	**0.969** (0.740-1.28)	**1.10** (0.815-1.50)	**1.29** (0.913-1.84)	**1.44** (0.986-2.13)
60-min	**0.419** (0.352-0.503)	**0.529** (0.445-0.636)	**0.682** (0.571-0.822)	**0.813** (0.675-0.988)	**1.00** (0.802-1.26)	**1.15** (0.904-1.49)	**1.32** (1.00-1.74)	**1.49** (1.11-2.04)	**1.75** (1.24-2.49)	**1.96** (1.34-2.90)
2-hr	**0.568** (0.478-0.682)	**0.710** (0.597-0.854)	**0.904** (0.758-1.09)	**1.07** (0.889-1.30)	**1.31** (1.05-1.65)	**1.50** (1.17-1.93)	**1.70** (1.30-2.25)	**1.92** (1.42-2.62)	**2.24** (1.59-3.19)	**2.50** (1.71-3.70)
3-hr	**0.671** (0.565-0.806)	**0.837** (0.703-1.01)	**1.06** (0.891-1.28)	**1.25** (1.04-1.53)	**1.53** (1.22-1.93)	**1.75** (1.37-2.25)	**1.98** (1.51-2.62)	**2.23** (1.65-3.04)	**2.59** (1.83-3.69)	**2.88** (1.97-4.26)
6-hr	**0.875** (0.736-1.05)	**1.09** (0.919-1.32)	**1.39** (1.17-1.68)	**1.64** (1.36-1.99)	**1.99** (1.59-2.50)	**2.26** (1.77-2.92)	**2.55** (1.95-3.38)	**2.86** (2.12-3.90)	**3.29** (2.33-4.69)	**3.64** (2.48-5.38)
12-hr	**1.12** (0.939-1.34)	**1.42** (1.19-1.70)	**1.81** (1.52-2.19)	**2.14** (1.78-2.60)	**2.59** (2.08-3.26)	**2.94** (2.30-3.79)	**3.30** (2.52-4.37)	**3.68** (2.72-5.01)	**4.19** (2.97-5.97)	**4.60** (3.14-6.80)
24-hr	**1.37** (1.21-1.59)	**1.77** (1.56-2.05)	**2.29** (2.01-2.65)	**2.71** (2.36-3.17)	**3.28** (2.77-3.96)	**3.72** (3.08-4.58)	**4.17** (3.37-5.25)	**4.63** (3.65-5.99)	**5.26** (3.99-7.07)	**5.74** (4.21-7.98)
2-day	**1.68** (1.48-1.94)	**2.18** (1.92-2.52)	**2.83** (2.49-3.29)	**3.37** (2.94-3.94)	**4.09** (3.46-4.94)	**4.65** (3.85-5.73)	**5.22** (4.22-6.57)	**5.80** (4.57-7.50)	**6.59** (5.00-8.87)	**7.20** (5.29-10.0)
3-day	**1.88** (1.66-2.17)	**2.45** (2.16-2.84)	**3.20** (2.81-3.72)	**3.82** (3.33-4.46)	**4.65** (3.93-5.62)	**5.30** (4.39-6.52)	**5.95** (4.82-7.50)	**6.63** (5.23-8.58)	**7.55** (5.73-10.2)	**8.27** (6.07-11.5)
4-day	**2.04** (1.80-2.36)	**2.67** (2.35-3.10)	**3.50** (3.08-4.07)	**4.19** (3.65-4.90)	**5.12** (4.33-6.18)	**5.84** (4.84-7.19)	**6.57** (5.32-8.28)	**7.33** (5.78-9.49)	**8.37** (6.35-11.3)	**9.18** (6.74-12.8)
7-day	**2.38** (2.09-2.75)	**3.13** (2.76-3.63)	**4.14** (3.64-4.80)	**4.97** (4.33-5.81)	**6.11** (5.16-7.37)	**6.99** (5.79-8.61)	**7.90** (6.40-9.96)	**8.85** (6.98-11.4)	**10.1** (7.69-13.7)	**11.2** (8.19-15.5)
10-day	**2.63** (2.32-3.05)	**3.49** (3.08-4.05)	**4.64** (4.08-5.39)	**5.59** (4.88-6.54)	**6.91** (5.84-8.34)	**7.94** (6.58-9.77)	**8.99** (7.28-11.3)	**10.1** (7.97-13.1)	**11.6** (8.82-15.6)	**12.8** (9.42-17.8)
20-day	**3.19** (2.81-3.69)	**4.28** (3.77-4.96)	**5.75** (5.05-6.68)	**6.99** (6.09-8.18)	**8.71** (7.36-10.5)	**10.1** (8.35-12.4)	**11.5** (9.32-14.5)	**13.0** (10.3-16.8)	**15.1** (11.5-20.3)	**16.8** (12.3-23.3)
30-day	**3.78** (3.33-4.37)	**5.10** (4.49-5.90)	**6.89** (6.06-8.00)	**8.41** (7.33-9.84)	**10.6** (8.92-12.7)	**12.3** (10.2-15.1)	**14.1** (11.4-17.7)	**16.0** (12.6-20.7)	**18.6** (14.1-25.1)	**20.8** (15.3-28.9)
45-day	**4.46** (3.93-5.16)	**6.01** (5.30-6.96)	**8.15** (7.17-9.47)	**9.98** (8.70-11.7)	**12.6** (10.6-15.2)	**14.7** (12.2-18.1)	**16.9** (13.7-21.3)	**19.3** (15.2-25.0)	**22.7** (17.2-30.5)	**25.4** (18.7-35.4)
60-day	**5.15** (4.55-5.96)	**6.93** (6.10-8.02)	**9.39** (8.25-10.9)	**11.5** (10.0-13.5)	**14.6** (12.3-17.6)	**17.0** (14.1-21.0)	**19.7** (15.9-24.8)	**22.5** (17.8-29.2)	**26.6** (20.2-35.8)	**30.0** (22.0-41.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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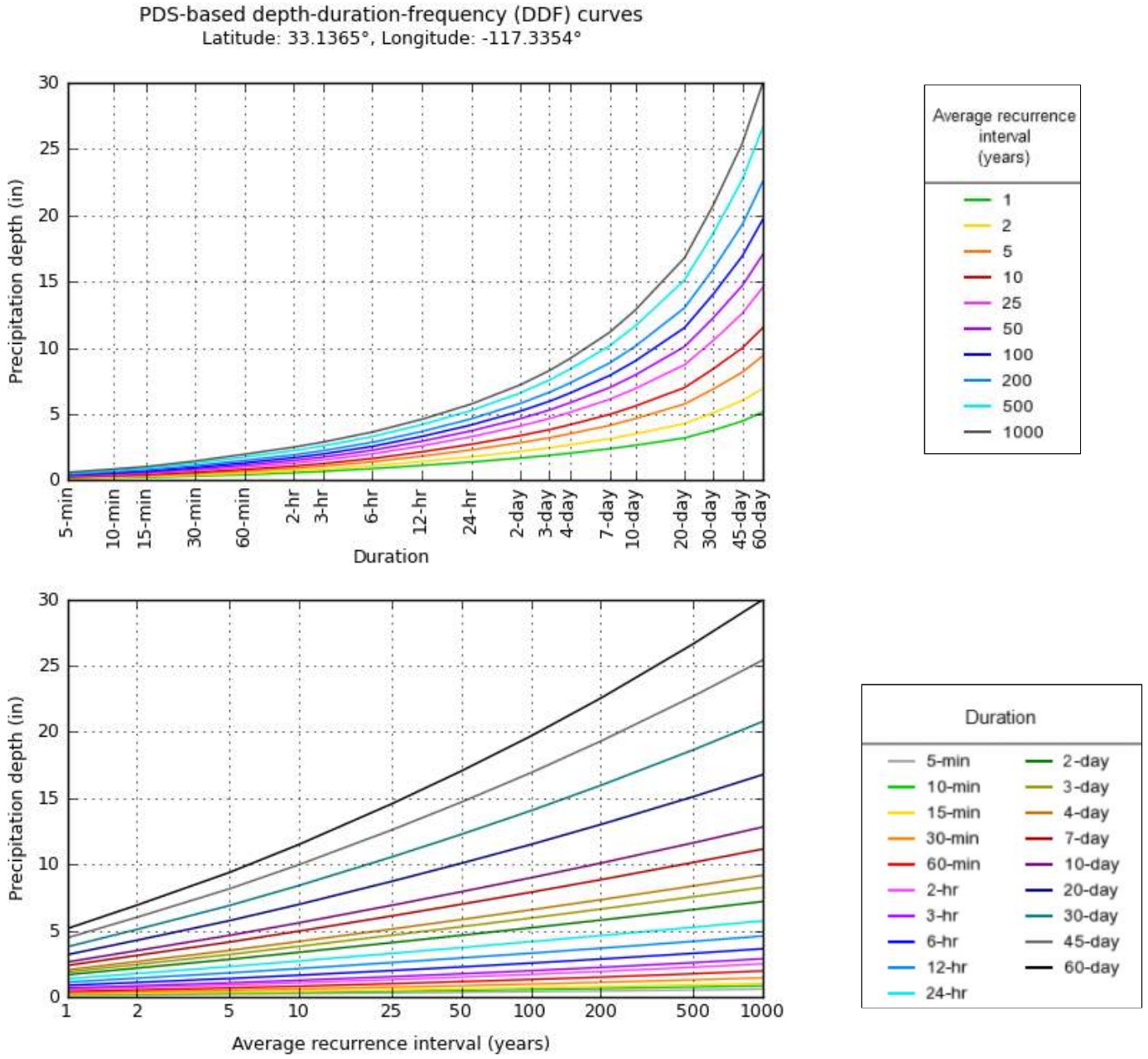
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Fri May 31 20:19:41 2019

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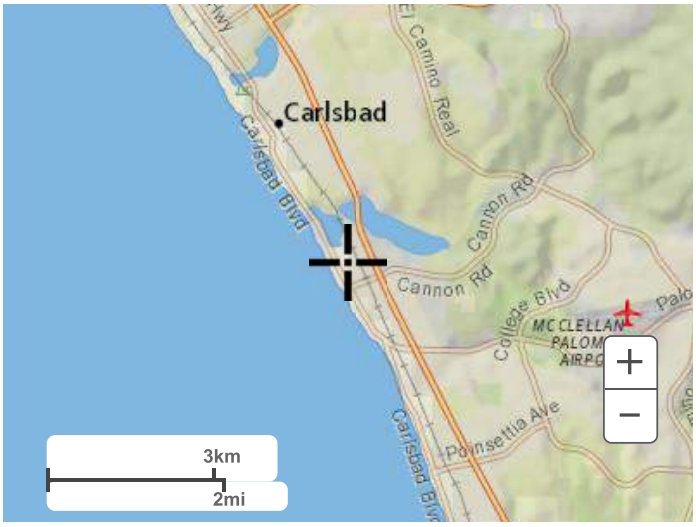
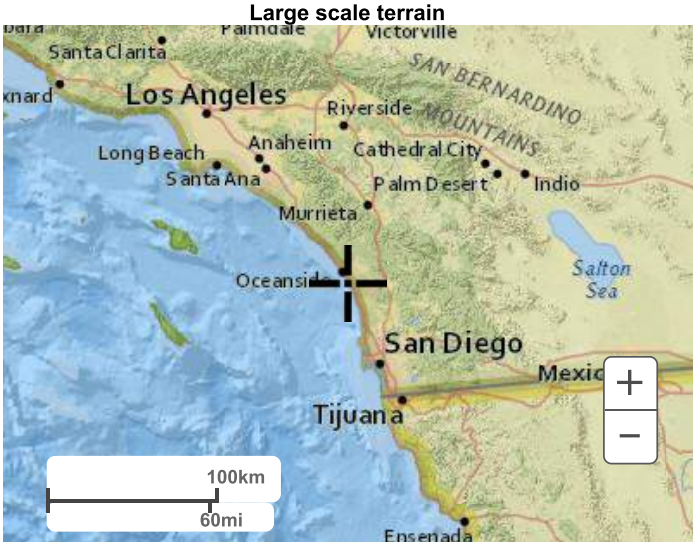
Maps & aerials

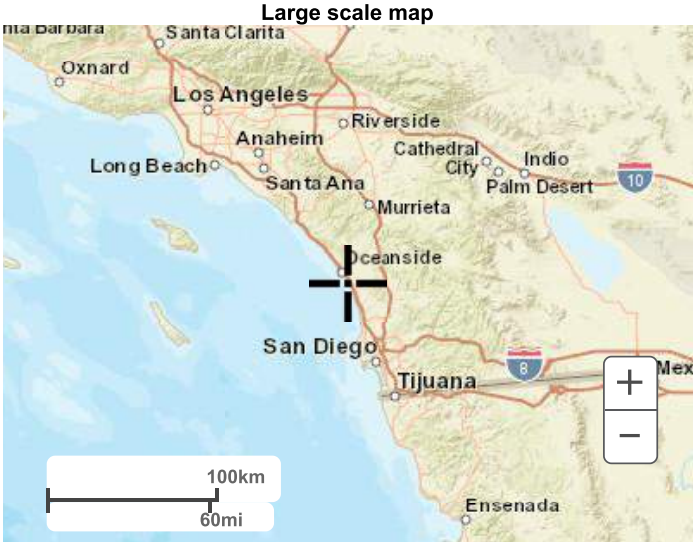
Small scale terrain



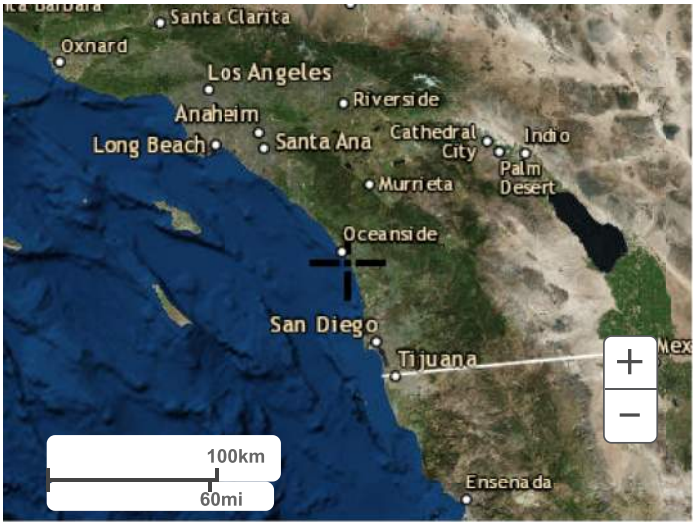
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

ATTACHMENT 2 – CSMP: MONITORING RECORDS

Rain Event Action Plan (REAP)

Date of REAP		**WDID Number:**	9 37C88251
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 ❑ 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 (e.g., 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:_____ ❑ _____ ❑

❑ 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)

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:

ATTACHMENT 3 – CSMP: EXAMPLE CHAIN-OF-CUSTODY

BURNS McDONNELL

03082011 Form WCD-KC1-SDO

Request for Chemical Analysis and Chain of Custody Record

Burns & McDonnell Engineering
400 Oyster Point Blvd. Suite 533
South San Francisco, CA 94080
Phone: (650) 871-2926 Fax: (650) 871-2653

Attention:

Laboratory: ELAP Laboratory
Address: Laboratory Road
City/State/Zip: Laboratory City,CA, 12345
Telephone: 615-758-5858

Document Control No:

Lab. Reference No. or Episode No.:

Project Number: BMcD Project #:115381

Client Name: NRG - Encina Power Station

Sample Number			Sample Event		Sample Depth (in feet)		Sample Collected		Sample Type / Matrix			Number of Containers	Analysis: Turbidity							Remarks
Group or SWMU Name	Sample Point	Sample Designator	Round	Year	From	To	Date	Time	Liquid	Solid	Gas									
	B-03		Nov	2019			11.12	0845	X			2	X							
																				pH_____
																				In-Situ Reading

EXAMPLE

Sampler (signature): QSP

Sampler (signature):

Special Instructions:

Relinquished By (signature):	Date/Time	Received By (signature):	Date/Time
1. QSP	11/12/19 1530	ELAP Laboratory	11/12/19 1530
Relinquished By (signature):	Date/Time	Received By (signature):	Date/Time
2.			

Ice Present in Container: Yes [X] No [ ]

Temperature Upon Receipt:

Laboratory Comments:

ATTACHMENT 4 – CSMP: EXAMPLE PH AND TURBIDITY METER INSTRUCTIONS

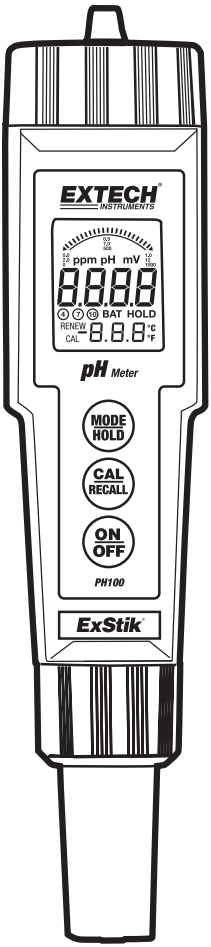
EXTECH INSTRUMENTS

USER GUIDE

ExStik™ Waterproof pH Meters

Models PH100 and PH110

Patent Pending



EXAMPLE ONLY:
Sampler May Use
Different Brand/Model

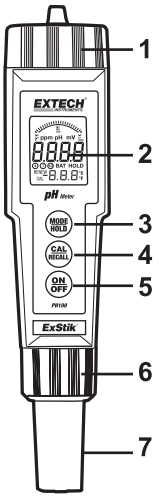
CE

Introduction

Thank you for selecting the Extech Model PH100 and/or the model PH110 (refillable) meter. This instrument is designed for high accuracy pH testing. This device is shipped fully tested and calibrated and, with proper use, will provide years of reliable service. Please visit our website (www.extech.com) to check for the latest version of this User Guide, Product Updates, Product Registration, and Customer Support.

ExStik™ Description

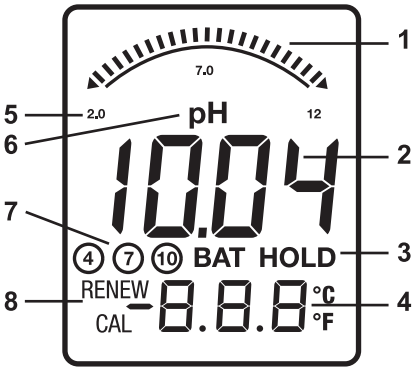
Front Panel Controls



1. Battery compartment cap
2. LCD Display
3. MODE / HOLD button
4. CAL / RECALL button
5. ON/OFF button
6. Electrode collar
7. Electrode (refillable)

(Electrode cap is not shown)

Display



1. Bargraph reading
2. Measurement reading
3. BAT (low battery) and HOLD (data hold) indicators
4. Temperature display
5. Bargraph scale designations
6. Units of measure
7. Calibration indicators
8. RENEW and CAL indicators

CAUTIONS

- This device is not a toy and must not reach children's hands. It contains hazardous objects as well as small parts that the children could swallow. In case a child swallows any of them, please contact a physician immediately
- Do not leave batteries and packing material lying around unattended; they can be dangerous for children if they use them as toys
- In case the device is going to be unused for an extended period of time, remove the batteries to prevent them from draining
- Expired or damaged batteries can cause cauterization on contact with the skin. Always, use suitable hand gloves in such cases
- See that the batteries are not short-circuited. Do not throw batteries into the fire.

Overview

pH Overview

pH is a unit of measure (ranging from 0 to 14pH) indicating the degree of acidity or alkalinity of a solution. pH tests are the most commonly performed measurements in water analysis and reports the negative log of the hydrogen ion activity of a solution which is an indicator of acidity or alkalinity. Solutions with a pH less than 7 are considered acidic, solutions with a pH higher than 7 are known as bases, and solutions with a pH of exactly 7 are neutral.

The pH scale is logarithmic so, for example, if sample A is 1 pH less than Sample B, this means that Sample A is 10 times more acidic then Sample B. A difference of 1 pH represents a ten-fold difference in acidity.

Getting Started

- For new meters, remove the battery cap and then remove the battery insulating strip.
- Remove the cap from the bottom of the ExStik™ to expose the electrode glass surface and reference junction
- Before first use or after extended storage, soak the electrode (with its cap removed) in a pH 4 solution for about 10 minutes
- White KCL crystals may be present in the cap. These crystals will dissolve in the soak or they can be simply rinsed with tap water
- Always calibrate close to the expected measurement value
- A sponge is located in the electrode protective cap. Keep this sponge soaked with a pH 4 solution to preserve Electrode life during storage

Replacing Electrodes

The ExStik™ is shipped with an electrode attached. Electrode life is limited and is dependent on (among other factors) frequency of use and care. If the electrode needs to be replaced, follow these steps for removing and connecting electrodes. Note that the PH110 has a refillable electrode.

1. To remove an electrode, unscrew and completely remove the electrode retaining collar.
2. Gently rock the electrode from side to side, pulling it away from the meter, until it disconnects.
3. To attach an electrode, carefully plug the electrode into the meter socket (note that the electrode connector is keyed, ensuring proper connection).
4. Secure the electrode in place by tightly turning the collar in place. (a rubber gasket seals the electrode with the meter).

Automatic Electrode Recognition

When the ExStik™ is turned on, it recognizes the type of electrode that is connected and displays the appropriate unit of measure. Attach electrode before turning the ExStik™ on.

Powering the ExStik™

If the batteries are weak, the 'BAT' indicator appears on the LCD. Press the ON/OFF key to turn the ExStik™ on or off. The auto power off feature shuts the ExStik™ off automatically after 10 minutes of inactivity to preserve battery life.

Operation

Overview

When the electrode is placed in a solution, the main display and bargraph indicate the pH reading while the lower display reads temperature (readings flash until they have stabilized). The bargraph is 'center zero', i.e. at pH 7 there is no display. As the pH rises, the bar moves from the center to the right. If the pH drops, the bar moves from the center to the left.

pH Calibration (1, 2, or 3 points)

A two point calibration with a buffer of 7 plus 4 or 10 (whichever is nearest to the expected sample value) is always recommended. A one point calibration (choose the value closest to the expected sample value) is also valid. For best accuracy, always calibrate at the sample temperature.

1. Place the electrode into a buffer solution (4, 7, or 10) and momentarily press the CAL key. pH 7 should be calibrated first, then 4 and/or 10 pH.
2. The ExStik™ automatically recognizes the solution and calibrates itself to that value. Note: If the solution is more than 1pH off from the 4, 7, or 10pH standard, the ExStik™ will assume an error and abort the calibration. CAL and END will be displayed.
3. During calibration, the pH reading flashes on the main display.
4. When calibration is complete, the ExStik™ automatically displays 'END' and returns to normal operation mode.
5. The appropriate circled indicator ④ ,⑦ , or ⑩ will appear on the LCD when a calibration has been completed. The calibration data is stored until a new calibration is performed.
6. For a two or three point calibration, repeat steps 1-4.

Note: Always turn the meter off and then on before calibrating to allow sufficient time to complete the calibrations during one power cycle. If the meter auto powers off during calibration the calibrations remain valid, but new calibrations will turn the circled indicators off.

Note: The Automatic Temperature Compensation (ATC) circuit is not active during calibration. To ensure a more accurate calibration, make sure that the calibration buffers are at 25°C (77°F).

RESET

If the meter will not calibrate or displays a -1, reset the meter and attempt to re-calibrate.

1. Turn off the meter.
2. Remove the battery cartridge from the top of the meter.
3. Press the On/Off button for 10 seconds to bleed off all charges within the meter.
4. Re-insert the batteries and power on the meter.
5. Attempt to re-calibrate the meter.

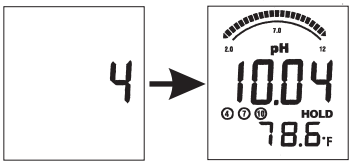
Changing the Displayed Temperature Units

Press and hold the CAL button for approx. 3 seconds. The °C or °F icon will change first and the numerical temperature value will change *after* the button is released. If the Calibration mode is accidentally accessed 'CAL' appears on the LCD. Simply turn the ExStik™ off and start again.

Data Hold

Momentarily press the MODE button to freeze the current reading. The HOLD display icon will appear along with the held reading. The held reading will also be stored in memory. Momentarily press the MODE key to return to normal operation.

15-Storing Readings into Memory



1. Momentarily press the MODE button to store a reading. The LCD will briefly display the memory location number and then the value stored (Data Hold will activate).
2. Momentarily press MODE again to return to normal operation.
3. Repeat step 1 to store the next reading and so on.
4. After 15 readings are stored the ExStik™ will return to memory location 1 and start overwriting existing data with newly stored data.

Recalling Stored Readings

Note: Check that the HOLD symbol is not displayed. If it is, exit the HOLD function by momentarily pressing the MODE button.

1. Momentarily press the CAL button and then press the MODE button immediately after CAL is displayed; the storage location number (1 through 15) will flash. If the CAL mode is accidentally accessed (display flashing), press the CAL button again to exit.
2. The last reading stored will be displayed first. To advance through the stored readings, momentarily press the MODE button. The location number is displayed first, followed by the reading stored in that location.
3. To exit the recall mode, momentarily press the CAL button and the ExStik™ will return to normal operation.

CAL Reminder Display

When the ExStik™ is turned on in the pH mode for the 15th time without recalibration, the 'CAL' icon appears on the LCD indicating that the ExStik™ may require calibration. Some applications may require recalibration of the electrode more frequently than others. The CAL display is simply a reminder and will turn off when the pH electrode is recalibrated.

RENEW Display

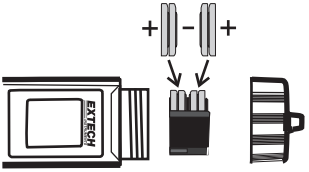
A flashing 'RENEW' warning indicates that the probe may be nearing the end of its useful life. If cleaning or recalibration does not cause the RENEW icon to disappear, replace the electrode. The RENEW display appears when the output of the pH electrode fails a diagnostic test.

Considerations

- If the unit appears to be locked (display frozen) it is possible that the Data Hold mode has been inadvertently accessed by pressing the MODE button. Simply press the MODE button again or turn the meter off and restart if the display appears frozen.
- If the meter does latch up and no button presses revive it, remove the batteries, push the ON button for 10 seconds and then reinsert the batteries.
- Note that if the batteries are removed, any stored readings will be discarded. Also, the user calibration data for pH will be cleared. New user pH calibration data is required. Factory calibration data for all models will be retained, however.

Battery Replacement

1. Twist off the battery compartment cap
2. Replace the four (4) 2032 batteries observing polarity.
3. Replace the battery compartment cap



Never dispose of used batteries or rechargeable batteries in household waste. As consumers, users are legally required to take used batteries to appropriate collection sites, the retail store where the batteries were purchased, or wherever batteries are sold.

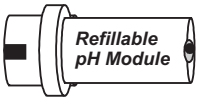
Disposal: Do not dispose of this instrument in household waste. The user is obligated to take end-of-life devices to a designated collection point for the disposal of electrical and electronic equipment.

Other Battery Safety Reminders

- Never dispose of batteries in a fire. Batteries may explode or leak.
- Never mix battery types. Always install new batteries of the same type.

pH Electrode Refilling (pH110/115 refillable electrode only)

The refillable electrode does not need to be detached from the body of the ExStik™ in order to perform the refilling procedure. Refillable electrodes (PH115) have a removable reference junction (slotted) and the word REFILLABLE on the side of the electrode housing.

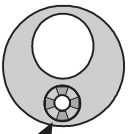


Removing the Reference Junction

The removal tool supplied with the PH113 Refill Kit is used to remove the reference junction from the sensing surface of the electrode. If the reference junction does not have slots for the 'teeth' of the removal tool to lock onto, the electrode is NOT refillable.

Holding the electrode upside down, unscrew and remove the reference junction using the removal tool.

Junction removal tool



Reference junction

Filling the Electrode

1. Once the reference junction  is removed, fill the cavity with the refill solution supplied in the Refill Kit.
2. Replace the reference junction using the removal/installation tool. (Spare junctions are provided if needed).

Filling Solution

The supplied container includes 15ml of filling solution. There is enough solution for 4 to 5 refills. Use only the supplied solution for refilling the electrode.

Specifications

Display	Multifunction LCD with Bargraph
Operating conditions	32 to 122°F (0 to 50°C) / < 80% RH
Range and Accuracy	0.00 to 14.00 / ± 0.01pH typical
Temp. Compensation	Automatic from 32 to 194°F (0 to 90°C)
Temperature Range	23 to 194°F (-5 to 90°C)
Temperature Resolution	0.1° up to 99.9 then 1° thereafter
Temperature Accuracy	± 1°C/1.8°F [from -5 to 50°C (23 to 122°F)]
	± 3°C/5.4°F [from 50 to 90°C (122 to 194°F)]
Measurement storage	15 tagged (numbered) readings
Power	Four (4) CR2032 button batteries
Low battery indication	'BAT' appears on the LCD
Auto power off	After 10 minutes of inactivity
Dimensions	1.4x6.8x1.6"(35.6x172.7x40.6mm); 3.85oz (110g)

Optional Accessories

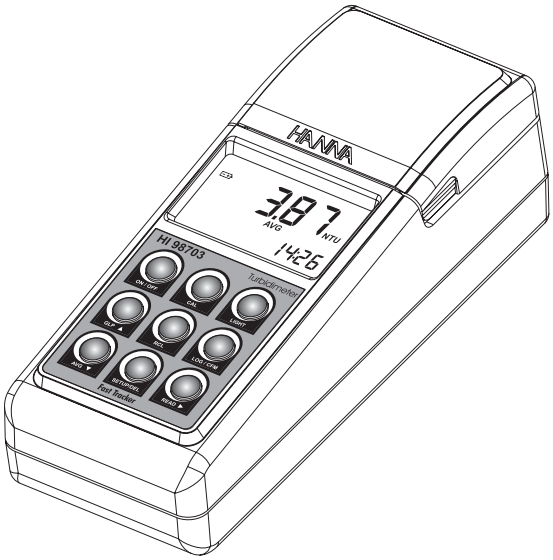
- Tripak buffers with 4, 7 & 10 pH capsules (6 each) plus two rinsing solutions (Part Number: PH103)
- pH 4.01 buffer, pint, (Part Number PH4-P)
- pH 7.00 buffer, pint, (Part Number PH7-P)
- pH 10.00 buffer, pint, (Part Number PH10-P)
- Spare pH Electrode – non-refillable (Part Number: PH105)
- Spare pH Electrode - refillable (Part number PH115)
- Electrode Refill solution (Part number PH113)
- Spare ORP electrode (Part Number: RE305)
- Spare Chlorine electrode (Part Number: CL205)
- Weighted base with 5 solution cups (Part Number: EX006)

Note: If the unit is to be converted for ORP or Chlorine use by attaching the proper electrode, please visit www.extech.com to download the proper User Guide

Instruction Manual

HI 98703

Portable Turbidimeter



HANNA instruments®
www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna Instruments product. This manual will provide you with the necessary information for correct use of the instrument.

Please read this instruction manual carefully before using the instrument.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or see the back side of this manual for our worldwide sales and technical service contacts.

This instrument is in compliance with CE directives.

WARRANTY

HI 98703 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge.

Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service Department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

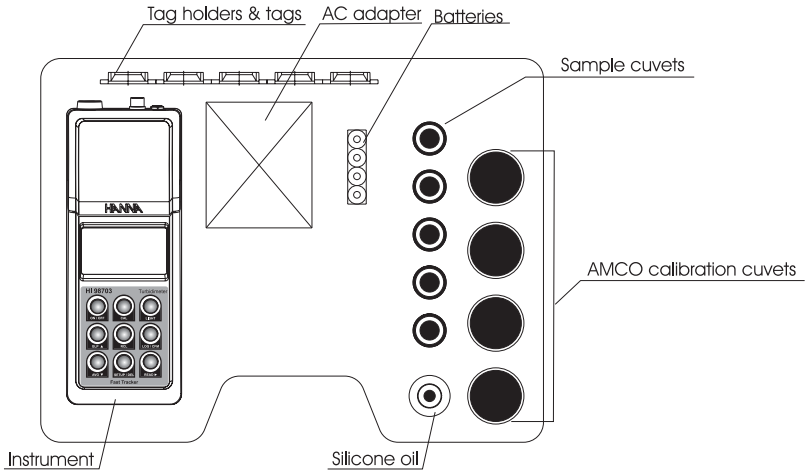
TABLE OF CONTENTS

PRELIMINARY EXAMINATION

Please examine this product carefully. Make sure the instrument is not damaged. If any damage has occurred during the shipment, please notify your dealer.

This **HI 98703** Portable Turbidimeter is supplied complete with:

- Five Sample Cuvets and Caps
- Calibration Cuvets (**HI 98703-11**)
- Silicone Oil (**HI 93703-58**)
- Tissue for wiping the cuvets
- Five Tag holders with Tags (**HI 920005**)
- Batteries (4 pcs.)
- AC Adapter
- Instruction Manual
- Instrument Quality Certificate
- Rigid carrying case



Note: Save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in the original packing with the supplied accessories.

GENERAL DESCRIPTION

HI 98703 is a high accuracy EPA compliant portable turbidimeter that benefits from Hanna's years of experience as manufacturer of analytical instruments. The **HI 98703** meets and exceeds the requirements of the **USEPA Method 180.1** for wastewater and **Standard Method 2130 B** for drinking water.

The instrument is specially designed for water quality measurements, providing a reliable and accurate reading on low turbidity values.

The **HI 98703** instrument measures the turbidity of a sample in the 0.00 to 1000 NTU (Nephelometric Turbidity Units) range. An effective algorithm calculates and converts the readings in NTU.

The instrument has an EPA compliance reading mode which rounds the reading to meet EPA reporting requirements.

Depending on the measured probe and needed accuracy, normal measurement, continuous measurement, or signal averaging measurement can be selected.

The instrument is based on a state-of-the-art optical system, which guarantees accurate results. The optical system, consisting in a tungsten filament lamp and two detectors (scattered and transmitted), assures long term stability and minimizes stray light and color interferences. It also compensates for variations in intensity of the lamp, minimizing the need of frequent calibration.

The 25 mm round cuvets made from special optical glass guarantee the repeatability and consistency of the measurements.

Calibration can be easily performed at any time in two, three ot four points (<0.1, 15, 100 and 750 NTU-adjustable calibration points), using the supplied or user prepared standards.

HI 98703 has complete GLP (Good Laboratory Practice) functions that allows traceability of the calibration conditions. The last calibration points, time and date can be checked at any time by a single touch.

HI 98703 has a very user-friendly interface, with an easy to read, large LCD (Liquid Crystal Display). The displayed codes guide the user step by step with routine operation and through calibration. Confirmation and acoustic signals help the user during instrument operation.

The **HI 98703** turbidimeter is a truly splash proof portable instrument. It is supplied with a rigid carrying case that offers protection for harsh environments.

One battery set is enough for at least 1500 measurements. The battery charging percentage and low battery condition are displayed on the LCD to avoid unexpected battery failure. In order to save the battery life, the instrument has an auto shut-off feature and will turn off after 15 minutes of non-use.

In addition, the instrument is equipped with backlight and the current time is continuously displayed on the LCD.

The instrument also provides a logging function. Up to 200 measurements can be stored in the internal memory and consulted at any time. Data can be downloaded to a PC for storing or further analysis through one of the two available ports: RS232 or USB.

For advanced field applications, the **HI 98703** turbidimeter is equipped with Tag Identification System (TIS) that makes data collecting and management simpler than ever.

TAG IDENTIFICATION SYSTEM

Hanna is the first manufacturer of turbidity instruments that has decided to add the unique T.I.S. - Tag Identification System to our Portable Turbidimeters, to meet the more restrictive needs of the users and fit all advantages of this system to the turbidity measurements and data management.

The system is designed for scientific and industrial applications, or to prove during safety audits and inspections that samples have been truly taken on pre-established locations.

The system is as easy to install as to operate. Just fix the so-called iButton® tags near your sampling sites that need to be checked often, and with this the T.I.S. is setup. The tag contains a computer chip embedded in a durable stainless steel can. It is designed to withstand the harsh environments, indoors or outdoors. The number of tags that can be installed is practically unlimited, because each tag has a unique identification code.

Immediately after tags installation you can start collecting data. Use the Portable Turbidimeter to take measurements and memorize the test result by pressing the Log-on-Demand key. Then, the instrument will ask for the tag identification. Simply touching the iButton® with the matching connector on the Portable Turbidimeter does identify and authenticate logging, by storing the iButton® serial number, time and date stamp.

The power of the T.I.S. features resides in the PC application. Download all test data to your PC and use our **HI 92000** Windows® compatible application software for further data management. You can sort or filter all your collected test data on different criteria like on a specific sampling location, parameter, date and time intervals, or fix range to filter measured values. The data can be plotted in a graph, exported to other common Windows® applications or printed for reporting purpose.

It is also possible to add new tags later on, thus increasing an already existing database. Each time the PC software recognizes a new added tag, it will ask for a description of the new sampling location.

ABBREVIATIONS

NTU	Nephelometric Turbidity Units
JTU	Jackson Turbidity Units
FTU	Formazin Turbidity Units
USEPA	US Environmental Protection Agency
LCD	Liquid Crystal Display
RTC	Real Time Clock
RH	Relative Humidity
TIS	Tag Identification System
ID	Identification

iButton® is registered Trademark of "MAXIM/DALLAS semiconductor Corp."

PRINCIPLE OF OPERATION

Turbidity of the water is an optical property that causes light to be scattered and absorbed, rather than transmitted. The scattering of the light that passes through a liquid is primarily caused by the suspended solids. The higher the turbidity, the greater the amount of scattered light. Because even the molecules in a very pure fluid scatter light to a certain degree, no solution will have zero turbidity.

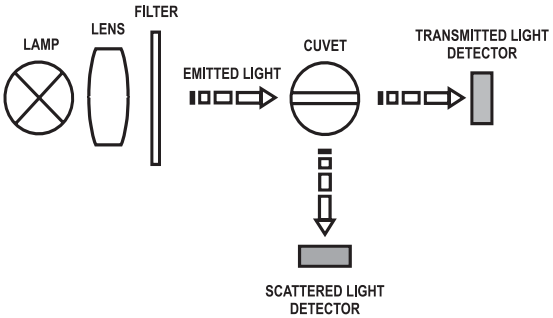
The **USEPA Method 180.1** specify the key parameters for the optical system to measure turbidity for drinking, saline and surface water in a 0 to 40 NTU range, using the nephelometric method.

The **HI 98703** Portable Turbidimeter is designed to meet or exceed the criteria specified by the **USEPA Method 180.1** and **Standard Method 2130 B**.

The light beam that passes through the sample is scattered in all directions. The intensity and pattern of the scattered light is affected by many variables like wavelenght of the incident light, particle size, shape, refractive index and color.

The Hanna's **HI 98703** is based on a state-of-the-art optical system that guarantee both high performance and reliable results.

This optical system includes a tungsten filament lamp, a scattered light detector (90^0) and a transmitted light detector (180^0). The microprocessor of the instrument calculates from the signals that reaches the two detectors, the NTU value, using an effective algorithm. This algorithm corrects and compensates for interferences of color, making the **HI 98703** turbidimeter color-compensated.



The optical system and measuring technique alow the compensation of lamp intensity fluctuations, minimizing the need of frequent calibration.

The lower detection limit of a turbidimeter is determined by the so called "stray light". Stray light is the light detected by the sensors, that is not caused by light scattering from suspended particles. The optical system of **HI 98703** turbidimeter is designed to have very low stray light, providing accurate results for low turbidity samples. However, special care must be taken when measuring low turbidities (see General Tips for an Accurate Measurement for sample preparation and measuring techniques).

MEASUREMENT UNITS

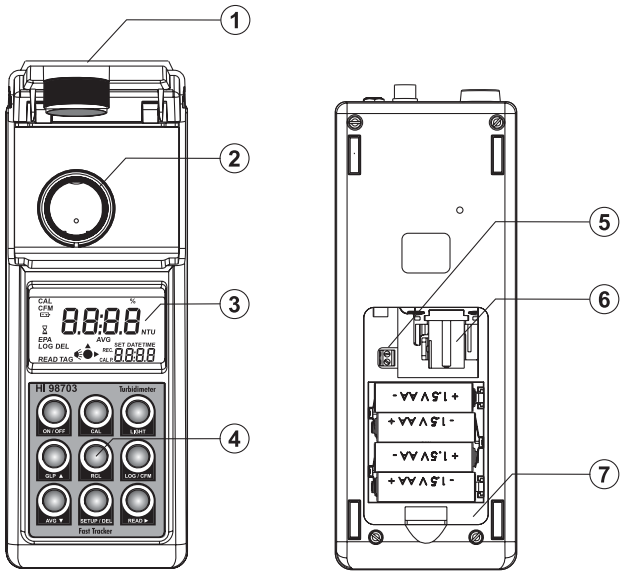
Many methods were used to measure turbidity over the years. The Jackson Candle Turbidimeter was used to measure turbidity as Jackson turbidity units (JTU). The Secchi Disk is commonly used to measure turbidity in lakes and other deep waters (mg/L SiO_2). Both methods are visual and are not considered very accurate. To obtain more accurate readings a nephelometer should be used as a turbidity reading instrument.

The **HI 98703** turbidimeter reports the measurements only in NTU (Nephelometric Turbidity Units). NTU units are equal to FTU units (Formazine Turbidity Units). The conversion table between these measurement units is shown bellow:

	JTU	NTU/FTU	SiO_2 (mg/L)
JTU	1	1.9	2.50
NTU/FTU	0.053	1	0.13
SiO_2 (mg/L)	0.4	7.5	1

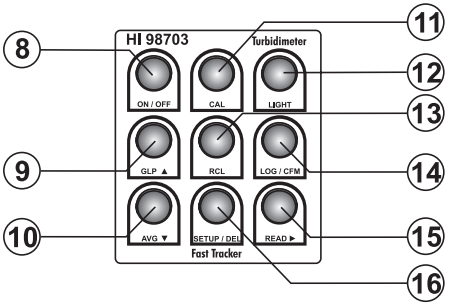
FUNCTIONAL DESCRIPTION

INSTRUMENT DESCRIPTION



1) Cuvet Lid. Close the cuvet lid prior to start a measurement.
2) Cuvet Holder. Insert the cuvet into the holder with the cuvet mark matching the case mark.
3) Liquid Crystal Display (LCD). The LCD has backlight for better visibility in dark environments.
4) Keypad. Splash proof resistant.
5) Lamp connector. Connect the new lamp using a screwdriver during lamp changing procedure.
6) Lamp. Replacable tungsten lamp.
7) Battery Lid. Remove the battery lid in order to change batteries or replace the lamp.

KEYPAD DESCRIPTION



8) ON/OFF, press to turn the instrument ON/OFF. If no key is pressed for more than 15 minutes, the instrument automatically shuts off.

9) GLP ▲ , press to enter/exit GLP feature. In SETUP it is used to increase the set values. In Log Recall it is used to select a newer record (scroll up).

10) AVG ▼ , press to set the average reading mode ON/OFF. In SETUP it is used to decrease the set values. In Log Recall it is used to select an older record (scroll down).

11) CAL, press to enter/exit calibration. During setup it is used to start/stop editing a parameter.

12) LIGHT, press to turn ON/OFF the backlight.

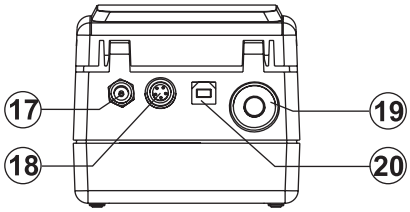
13) RCL, press to enter/exit viewing log content.

14) LOG/CFM, press to save the log records or to confirm the selected option.

15) READ ►, press to start a measurement. Press and hold READ to make a continuous measurement. In Log Recall it is used to see the content of a record. In GLP it is used to see all available informations. In SETUP, during date or time editing, it is used to move the focus on the next setting item.

16) SETUP/DEL, press to enter/exit setup. The DEL function is available in Log Recall to delete one or all records. In GLP it is used to delete the user calibration.

CONNECTORS DESCRIPTION



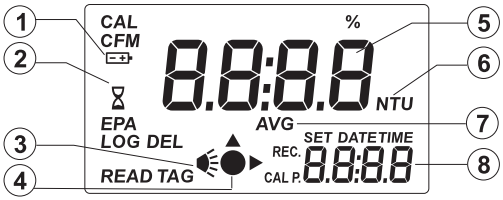
17) AC adapter connector, used to connect an external AC Adapter.

18) RS232 connector, used to transfer data through the RS232 connection. Use **HI 920011** serial cable to connect to the PC.

19) Tag reader connector. Touch the tag with the connector to read the location identification number during logging.

20) USB connector, used to transfer data to the PC.

DISPLAY DESCRIPTION



1) Battery icon. When it is ON, it shows that the instrument works on battery. When blinking, the batteries are almost empty and need to be replaced.
2) Wait icon. It is displayed when the instrument performs an internal checkup.
3) Lamp icon. The lamp icon is shown when the lamp is turned on.
4) Measurement icon. The icon shows the measuring scheme of the instrument.
5) Four digit main display. The main display shows the turbidity value after one measurement. Depending on the instrument working mode, other values or messages are displayed.
6) Measurement units. The turbidity is measured in NTU. When average or continuous mode is selected, the "NTU" tag blinks for each new displayed value. For conversions in other units see Measurement Units section.
7) AVG icon. When selected, the measurement will be taken in average mode. The "NTU" tag will blink for each new displayed value.
8) Four digit secondary display. The secondary display shows the current time (if selected) or other values/messages.

BEEPER

A beeper is used to make the user interface more friendly. An error or invalid key press is signaled by a long beep. A confirmation beep is signaled by a short beep. The beeper is selectable as ON or OFF in Setup Menu.

SPECIFICATIONS

Range	0.00 to 9.99 NTU 10.0 to 99.9 NTU 100 to 1000 NTU
Range Selection	Automatically
Resolution	0.01 NTU from 0.00 to 9.99 NTU 0.1 NTU from 10.0 to 99.9 NTU 1 NTU from 100 to 1000 NTU
Accuracy	±2% of reading plus 0.02 NTU
Repeatibility	±1% of reading or 0.02 NTU, whichever is greater
Stray Light	< 0.02 NTU
Typical EMC Deviation	±0.05 NTU
Light Source	Tungsten filament lamp
Lamp Life	Greater than 100,000 readings
Light Detector	Silicon Photocell
Method	Ratio Nephelometric signal (90') scatter light ratio transmitted light Adaptation of the **USEPA Method 108.1** and **Standard Method 2130 B**
Display	60 x 90mm LCD with backlight
Standards	15, 100 and 750 NTU
Calibration	One, two or three point calibration
LOG Memory	200 records
Serial Interface	RS232 or USB 1.1
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Power supply	4 x 1.5V AA alkaline batteries or AC adapter
Auto Shut-off	After 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.8 x 3.4 x 3.0")
Weight	512 g (18 oz.)

GENERAL TIPS FOR AN ACCURATE MEASUREMENT

HI 98703 is a highly accurate turbidimeter. To meet the instrument performance and fully benefit of its properties it is very important that the analyst perform accurate, precise and repeatable readings using proper measurement techniques. Special care must be taken during sample preparation and handling.
The instructions listed below should be carefully followed during measurement and calibration to ensure best accuracy.

CUVET

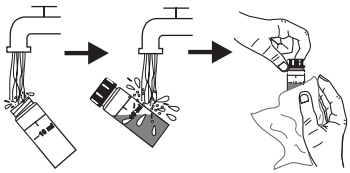
The cuvet is part of the optical system in all measurements. The light reaches the sample by passing through the cuvet glass. As a result, the measurement can be affected by the glass imperfections, dirt, dust, scratches, or fingerprints present on the cuvet surface.

CUVET HANDLING

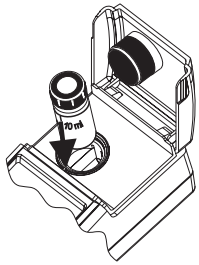
The cuvets should be free of scratches or cracks. Any cuvet with visible scratches will be discarded. The cuvets should be periodically washed with acid. After washing, the cuvets should be well rinsed many times with distilled or deionized water. Allow cuvets to air-dry and store them for long periods of time with caps, to avoid dirt entering inside. Always handle the cuvet by touching only the cap or its top side (over the horizontal line).
Always store the cuvets in separate boxes or with separators between them to avoid scratches on the surface.

CUVET PREPARATION

Whenever a cuvet is used, it must be clean inside and outside. When it is placed into the instrument, it must be dry outside, completely free of fingerprints or dirt.



If the cuvet is not indexed, put the cuvet with the factory mark aligned with the sign on the instrument top.



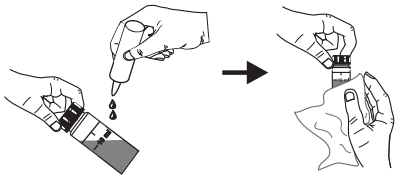
CUVET OILING

To hide minor imperfections and scratches, the cuvets should be oiled outside with the supplied silicone oil. This is very important, especially for low turbidity samples (< 1 NTU), otherwise scratches can contribute and alter turbidity readings.

The silicone oil has the same refractive index as the glass and will not alter the turbidity readings. It is important to apply only a thin layer of silicone oil.

Warning: Do not apply the oil in excess, it may retain dirt or contaminate the cuvet holder of the instrument, altering the turbidity readings.

It is very important to apply the silicone oil on a clean, dry cuvet. Apply a few drops of oil and wipe the cuvet thoroughly with a lint-free cloth. Wipe off the excess of oil till you obtain a thin, uniform layer. If the procedure is correctly followed, the cuvet should appear nearly dry with no visible oil.



Note: The supplied cloth for oiling should be stored together with the silicone oil bottle and cuvets, taking care to avoid contamination with dirt. After a few oiling procedures the cloth will contain enough oil to wipe the bottle with it without adding more oil. From time to time add some drops of oil on the cuvet to provide the necessary oil quantity in the cloth.

INDEXING A CUVET

It is very important for low turbidity readings to always insert the cuvet into the instrument in the same position.

All cuvets are factory indexed. This index can be used to put the cuvet with the factory mark on the cuvet aligned with the sign on the instrument top.

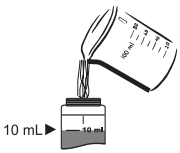
To further reduce the effect of glass imperfections, the cuvet can be indexed and use this new index as the position mark.

For indexing one cuvet or matching multiple cuvets the continuous reading mode is suggested. In this mode if READ ► is kept pressed, multiple successive readings are taken without turning off the lamp. After first reading is displayed, it is possible to open the cuvet lid and rotate the cuvet without generating an error condition. The turbidity is immediately displayed, reducing drastically the measurement time. The lamp of the instrument will turn off only when READ ► is released.

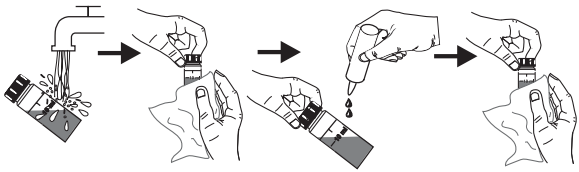
Note: The instrument can not perform continuous readings if the average mode is on.

In order to index a cuvet follow the next steps:

- Fill the cuvet with high quality water (<0.1 NTU) up to the line.

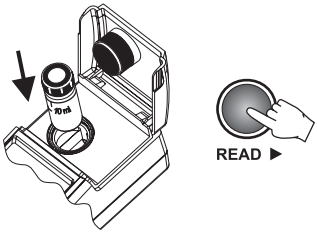


- Clean and oil the cuvet as described before.

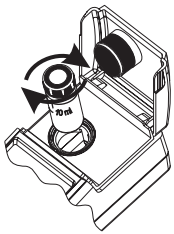


- Turn the instrument ON.

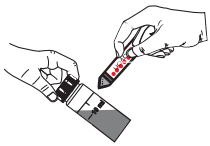
- Insert the cuvet into the instrument and press READ ▶. Record the reading.



- Open the instrument lid, slightly rotate the cuvet and take a new reading.



- Repeat the last step until you read the lowest NTU value. Alternatively, keep READ ▶ pressed and, after the first value is displayed, open the lid and start rotating the cuvet until the lowest NTU value is displayed.
- Mark this position on the thicker white band on the top of the cuvet with a water resistant pencil.
- Always use this position to align it with the sign on the instrument top.

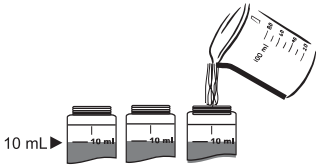


MATCHING MULTIPLE CUVETS

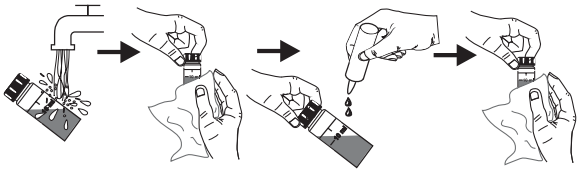
Precise measurements require the use of a single cuvet. If it is not possible, the cuvet selection and matching must be performed before taking measurements.

In order to match multiple cuvets follow the next steps:

- Fill some cuvets with high quality water (<0.1 NTU) up to the line.

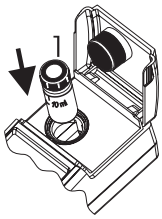


- Clean and oil the cuvets as described before.



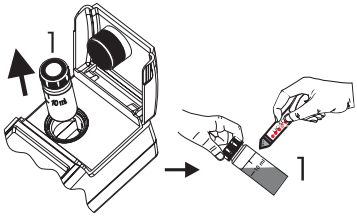
- Turn the instrument ON.

- Insert the first cuvet into the instrument and press READ ► . Record the reading.

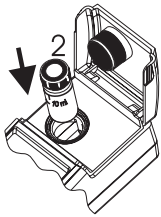


- Record the position of the cuvet and the displayed reading.

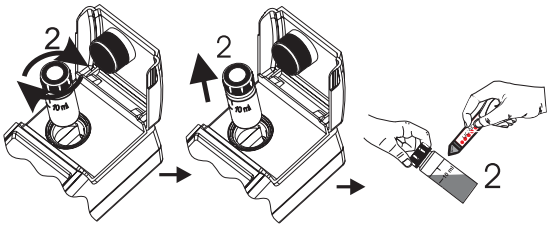
- Mark this position on the thicker white band on the top of the cuvet with a water resistant pencil.



- Insert the second cuvet into the instrument and take a reading.



- Open the instrument lid, slightly rotate the cuvet and take a new reading.



- Repeat the last step for the second cuvet until the reading is within 0.01 NTU of the value obtained for the first cuvet.
- Alternatively, keep READ ► pressed and, after the first value is displayed, open the lid and start rotating the cuvet until the displayed value matches the first cuvet.
- Mark this position on the second cuvet with a water resistant pencil.
- Follow the same procedure for all the necessary cuvets.

Note: If the cuvet is indexed, use the index to position it in the instrument.

SAMPLING TECHNIQUE

When taking turbidity measurements it is very important to select a representative sample. For consistent results, follow the next tips when sampling:

- Gently mix the water before taking the sample.
- If the sample is taken from a pipe, discard the first few liters.
- If measuring a non uniform source, collect samples from different places and mix them.

When measuring the collected sample, keep in mind the following:

- Samples should be analyzed immediately after collection because the turbidity can change in time.
- To avoid dilution of the sample it is better to rinse the cuvet with a quantity of sample and then discard. Only after this you can fill the cuvet with sample.
- Pay attention that cold samples do not condense on the sample cell.

REMOVING AIR BUBBLES

Any air bubbles present in the sample will cause high turbidity readings. To obtain accurate measurements, remove the air bubbles using one of these methods:

- Application of a partial vacuum;
- Addition of a surfactant, such as Triton X-100;
- Use of an ultrasonic bath;
- Heating the sample.

Sometimes it is necessary to combine two or more methods for efficient air bubble removal.

Note: Each method can alter the sample turbidity, if misused, so they have to be used with caution.

APPLICATION OF VACUUM

Vacuum works by decreasing the atmospheric pressure. In this way the bubbles from the solution came out to the surface.

Application of vacuum is a very simple procedure and can be applied with any vacuum source at hand. The simplest equipment at hand is a syringe and a rubber stopper for vacuum degassing.

Notes:
- Pay attention that the vacuum equipment be clean and oil-free.
- It is not recommended to apply vacuum to a viscous sample that contains volatile components. In such cases the vacuum can determine the volatile component of the viscous sample to increase the bubbles from the sample.

ADDITION OF SURFACTANT

Surfactant addition works by changing the surface tension of the water. In this way bubbles are released from the sample. This method is effective in samples that are supersaturated with air.

The procedure consists in the addition of a drop of surfactant in the cuvet before adding the sample to be analyzed.

A convenient surfactant to use for degassing is Triton X-100.

Warning: Pay attention that changing the surface tension will cause a rapid settling of particles that cause turbidity. To avoid this problem, analyze as soon as possible the sample.

Do not shake vigorously the sample because the surfactant may foam. If you are using the same cuvet, rinse it before adding a new sample in order to avoid surfactant accumulation.

Surfactant contribution to the turbidity readings is negligible.

Note: Surfactant addition should be used for degassing only when other methods are ineffective.

USE OF AN ULTRASONIC BATH

The ultrasonic waves are very effective in removing air bubbles from samples. However, ultrasonic waves should be used with care because they can alter sample turbidity characteristics, by modifying the shape and size of particles which cause turbidity. The ultrasonic waves can also break the existing air bubbles, leading to a complication of the degassing process.

In order to avoid excess application of the ultrasonic waves you can apply ultrasound until all visible air bubbles are removed, and then measure the sample turbidity. This is the most used procedure for degassing.

If you are not sure that all air bubbles were removed, apply ultrasonic waves again for a short period of time and then measure the turbidity. Repeat this procedure until the turbidity is increasing instead of decreasing, sign that turbidity of the sample was altered.

In order to degas a sample fill a clean cuvet with sample and immerse it (1/2 to 2/3 immersed) in an ultrasonic bath. Follow the degassing procedure described above. Only after the degassing procedure is finished, the cuvet can be capped.

HEATING THE SAMPLE

Use of heat to remove air bubbles, although very effective in some cases, should be handled with care because it can alter the turbidity of the sample. When heating a sample, the volatile components from the sample can vaporize, the suspended components can dissolve or the sample characteristics can change.

Therefore, the heating procedure should be used with extreme care.

The best way is to use a warm water bath and immerse the cuvet with sample into the bath. Heat the sample only until the visible bubbles are removed.

Note: Always cool the heated sample to the original sample temperature before measurement.

The heating procedure can be used in combination with vacuum or ultrasonic waves application for a more effective air bubble removal.

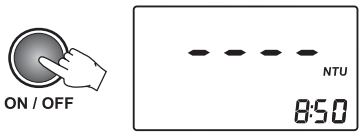
MEASUREMENT PROCEDURE

When taking any turbidity measurements several basic rules should be followed:

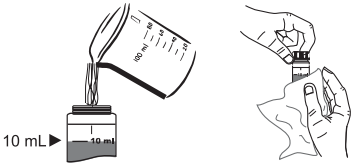
- Use always cuvets without scratches or cracks because they can cause inaccurate readings.
- Cap always the cuvets to avoid spillage of the sample into the instrument.
- Close always the lid of the instrument during measurement.
- Keep the lid of the instrument closed when it is not used to prevent dust or dirt entering.
- Put always the instrument on a flat, rugged surface when taking measurements.
- Do not operate in direct sunlight.
- Do not use too much oil to prevent contamination of the optical system.

To take turbidity measurements, follow the next steps:

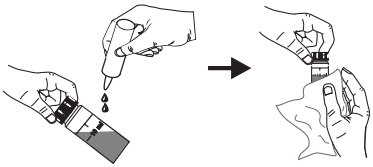
- Turn the instrument ON by pressing ON/OFF. When dashes are displayed on the LCD, the instrument is ready. On the secondary LCD the current time appears, if selected in SETUP menu.



- Fill a clean, dry cuvet with 10 mL of sample up to the mark, taking care to handle the cuvet by the top.
- Replace the cap.
- Wipe the cuvet thoroughly with a lint-free cloth to remove any fingerprints, dirt or water spots.

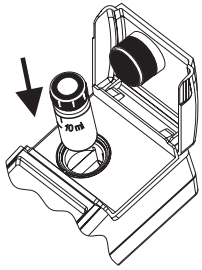


- Apply silicone oil on the cuvet and wipe with a lint-free cloth to obtain an even film over the entire surface of the cuvet.



Note: It is very important to oil the cuvet, especially for low turbidity values (< 1 NTU) to hide the glass imperfections that can influence the reading.

- Place the cuvet into the instrument. Align the mark from the cuvet with the sign on the instrument case and close the lid.



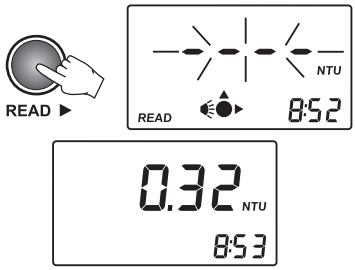
Note: If you have a cuvet with orientation mark, place the cuvet into the instrument with the orientation mark aligned with the sign on the instrument top.

NORMAL MEASUREMENT

This type of measurement can be used for regular measurements, when the sample is stable and normal accuracy is required. In normal measurement mode, the lamp is ON for a minimum period of time (about 7 seconds), saving the battery life. Normal measurement takes about 10 seconds.
If normal measurement is selected, the "AVG" tag will not be displayed.

- Press READ ► to start the measurement.
  The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement.

  At the end of the measurement, the instrument directly displays turbidity in NTU.



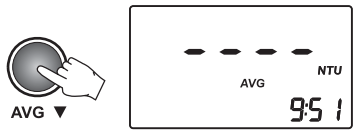
CONTINUOUS MEASUREMENT

This measurement mode can be used when many measurements have to be taken in a short period of time. The feature is also useful to evaluate a very fast settling sample. This measurement mode is recommended for indexing cuvets. After the first reading is taken, the lid opening will not generate any errors.
The first value is displayed after about 10 seconds and then a new reading is displayed each second. In order to make a continuous measurement keep READ ► pressed until the desired number of measurements are taken. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear. When a new value is displayed, the cuvet icon and the measurement unit will briefly blink.
The last value remains on the display after the READ ► is released.

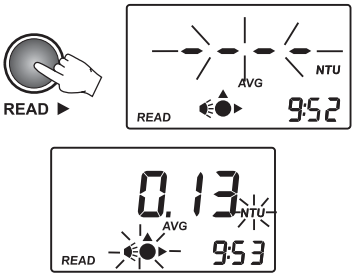
AVERAGED MEASUREMENT

Select this measurement mode when samples that cause unstable readings are analyzed. By averaging several readings, the random noise generated by the sample is reduced and accurate measurements can be taken.
This mode can also be selected when high accuracy measurements are desired. In the average mode 10 measurements are averaged in a short period of time (about 20 seconds). The initial value is displayed after 10 seconds and the display is updated every second with an intermediate value.

- To select the averaged measurement mode press AVG ▼.
  When this mode is selected, the AVG icon will be displayed on the LCD.

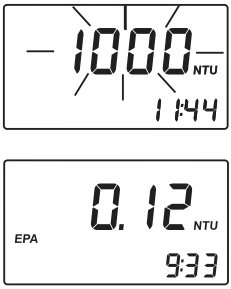


- Press READ ► to start the average reading mode. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement. When a new partial value is displayed, the cuvet icon and the measurement unit will blink shortly.
  When the measurement is ended, the final averaged result is displayed directly in NTU.



RANGE AND UNITS

HI 98703 automatically selects the correct range to display the results with the highest accuracy. If the measured value is higher than 1000 NTU (over range), the display will show the maximum value blinking.
The instrument has an EPA compliance reading mode. If this feature is activated in SETUP, "EPA" tag will appear on the LCD and the readings will be rounded to meet EPA reporting requirements, as shown in the table:



NTU	Record to Nearest
0.0-1.0	0.05
1-10	0.1
10-40	1
40-100	5
100-400	10
400-1000	50
> 1000	100

CALIBRATION PROCEDURE

HI 98703 has a powerful calibration function that compensates for lamp aging or changing. The calibration can be done using the suplied calibration solutions or user prepared standards.

HI 98703 turbidimeter is supplied with 4 AMCO standards: <0.1 NTU, 15 NTU, 100 NTU and 750 NTU. The Hanna standards are specially designed for this instrument. The turbidity standards have a shelf life and should not be used after the expiration date.

Alternatively, formazin standards can be used. It is recommended that the prepared calibration solutions to be close to the default calibration points.

The first point should be near 0 NTU. The second point can be chosen between 10 and 20 NTU, the third point between 50 and 150 NTU and the fourth point between 600 and 900 NTU.

FORMAZIN PREPARATION

In order to prepare formazin 4000 NTU stock solution, follow the next procedure:

Solution I Dissolve 1.000 grams of hydrazine sulfate, $(NH_2)_2$ H_2SO_4, in distilled, deionized water and dilute to 100 mL in a volumetric flask.

Warning: Handle hydrazine sulfate with care because it is a carcinogen reagent. Avoid inhalation, ingestion, or skin contact. Formazin solution can also contain some hydrazine traces.

Solution II Dissolve 10.000 grams of hexamethylenetetramine, $(CH2)_6N_4$, in distilled, deionized water and dilute to 100 mL in a volumetric flask.

Stock solution Mix 10 mL Solution I and 10 mL Solution II in a flask. Let the stock solution stays 48 hours at 25±3°C (77±5°F). This will result in a 4000 NTU formazin suspension. It is very important for the formation of the formazin polymer to maintain the same temperature.

The stock solution (4000 NTU) can be stored up to one year in proper conditions. Store formazin in amber glass bottle or any UV-light blocking bottle.

To obtain a high quality formazin always use pure reagents and high-purity water.

To prepare the calibration standards, dilute the stock solution with the same high-purity water you used for the preparation of the stock solution.

The diluted formazin solutions are not stable. They should be used immediately after preparation and discard immediately after use.

If the prepared formazin is used, enter the actual standard value by pressing UP or DOWN key to edit the value of the second, third or fourth calibration point.

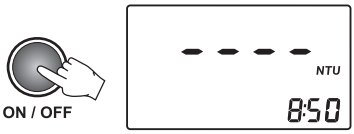
CALIBRATION

For best results, the measurement techniques must be followed during calibration. If formazin standards are used, mix the cuvets gently for about 1 minute and then allow the standard to settle for one more minute before calibration.

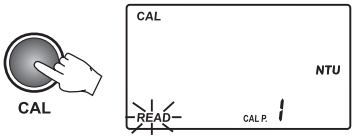
Calibration can be performed in two, three or four points. It is possible to interupt calibration procedure at any time by pressing CAL or ON/OFF.

TWO-POINT CALIBRATION

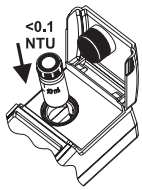
- Turn the instrument on by pressing ON/OFF. When the LCD displays dashes, the instrument is ready.



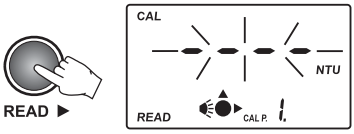
- Enter calibration mode by pressing CAL. The display will show "CAL P.1" and no suggested value. This first point is used to check the optical system.



- Place the <0.1 NTU standard cuvet into the holder and ensure that the cuvet mark is aligned with the sign on the instrument top.

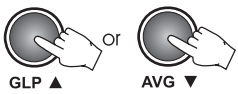


- Close the lid and press READ ►. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement. Alternatively, press LOG/CFM to skip the first point.

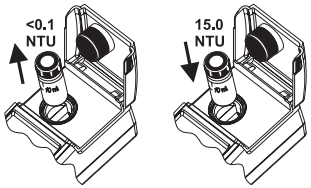


- The second calibration point (15.0 NTU) is then displayed on the primary LCD, "CAL P.2" on the secondary LCD, and "READ" tag will blink.

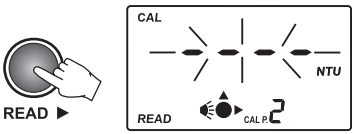
- If the prepared formazin is used, edit the displayed value by pressing UP or DOWN keys until the display shows the correct value.



- Remove the first standard cuvet and place the 15.0 NTU standard cuvet (or the prepared one) into the holder and ensure that the cuvet mark is aligned with the sign on the instrument top.

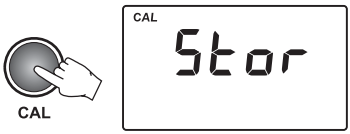


- Close the lid and press READ ►. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement.



- At the end of the measurement, the third calibration point (100 NTU) is displayed on the primary LCD, "CAL P.3" on the secondary LCD, and "READ" tag will blink.

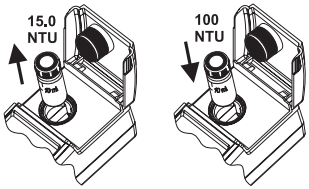
- At this moment it is possible to exit calibration by pressing CAL. The instrument will memorize the two-point calibration data and will return to measurement mode.



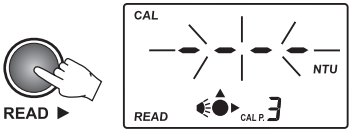
THREE-POINT CALIBRATION

To perform a three-point calibration, continue the procedure with the following steps:

- Remove the second standard cuvet.
- Place the 100 NTU standard cuvet (or the prepared formazin standard) into the holder, with the cuvet mark aligned with the sign on the instrument.

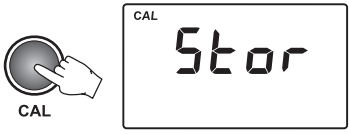


- Close the lid and press READ ►. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement.



- At the end of the measurement, the fourth calibration point (750 NTU) is displayed on the primary LCD and "CAL P.4" on the secondary LCD.

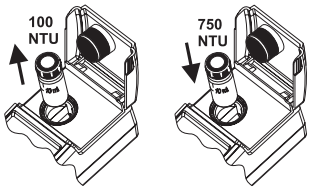
- At this moment it is possible to exit calibration by pressing CAL. The instrument will memorize the three-point calibration data and will return to measurement mode.



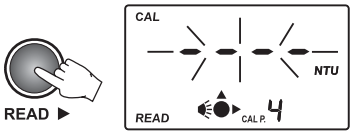
FOUR-POINT CALIBRATION

To perform a four-point calibration, continue the procedure with the following steps:

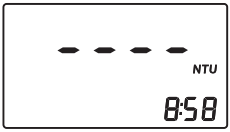
- Remove the third standard cuvet.
- Place the 750 NTU standard cuvet (or the prepared formazin standard) into the holder, with the cuvet mark aligned with the sign on the instrument.



- Close the lid and press READ ►. The display will show blinking dashes and the icons for cuvet, detectors and lamp will appear during measurement.

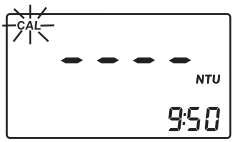


- At the end of the measurement, the four-point calibration is completed and the instrument returns automatically to measurement mode.



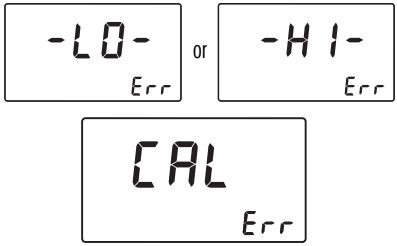
OUT CAL RANGE FUNCTION

The instrument has an **Out Cal Range** function to prevent taking measurements in a range where the calibration does not assure the best results. The range where the calibration assures correct measurements is up to 40 NTU for two-point calibration and up to 150% of the third point value for three-point calibration.
The display will show a blinking "CAL" tag each time the measurements are taken outside the calibration range.



CALIBRATION ERRORS

- If the read value during calibration is too far from the set value, the instrument will show "-LO-" or "-HI-" error.
- If the calculated calibration coefficients are outside a certain range, the "CAL Err" message is displayed.



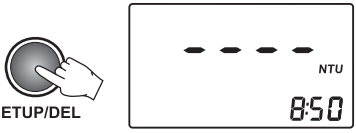
CALIBRATION DELETION

HI 98703 is factory calibrated. It is possible to restore factory calibration by deleting last performed calibration.
To delete last calibration, follow the next steps:

- Enter the GLP feature by pressing GLP ▲.
  The date of the last calibration will be displayed on the LCD.

- Press READ ► to see the information related to calibration. The last panel is the one with delete calibration.

- Press SETUP/DEL to delete the current calibration. After deletion the instrument will automatically return to measurement mode.



LOGGING

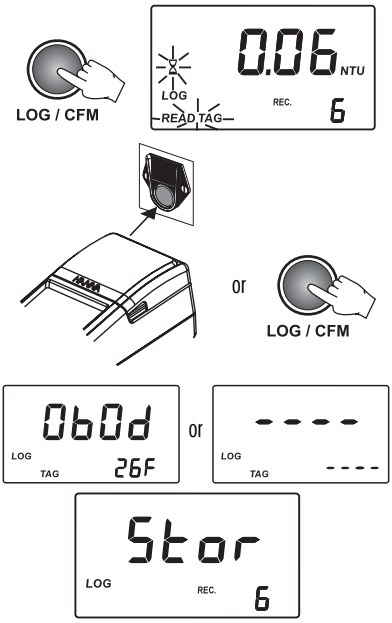
HI 98703 has a log space for up to 200 records. With each measurement, the date, time and tag ID is stored. In this way, each record is fully characterized and can be easily analyzed when downloading data on the PC application (**HI 92000**).

LOGGING

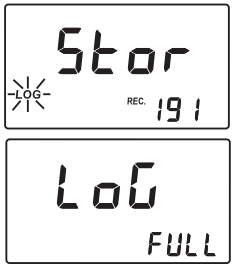
The log function is active after a valid measurement is obtained (no errors).

- To log a value, press LOG/CFM when the measurement result is displayed.
  The instrument asks to READ TAG for identification of the sampling location. The location for the new record is also displayed on the secondary LCD.
- To read the ID code for the sampling location identification, simply touch the iButton® tag with the matching connector, located on the back of the instrument (see Connectors Description, page 9). Alternatively, press again LOG/CFM to store the record without the tag ID code.
- If the tag is successfully read, the instrument will beep once, displaying the unique hexadecimal code of the tag, and store the data.

  After data is stored, the instrument returns to measurement mode.



Notes:
- If the tag is not read within 20 seconds, the logging procedure is canceled.
- A measurement can be stored only once. Also an over range value can be stored.
- If less than ten free records are available, the "LOG" tag will blink while storing data.
- If the log memory is full, the "LoG FULL" message will appear for a few seconds on the LCD and the instrument will return to measurement mode without storing the new record.



To store a new record, delete one or more records.

VIEW LOGGED DATA

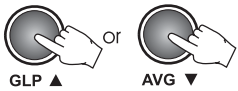
The stored records can be viewed at any moment by pressing RCL. To return to normal measurement mode, press RCL again .

LOG SEARCHING

The log records are stored in chronological order. The first displayed record is the last stored one.

- Press UP or DOWN keys to scroll the log memory record by record. By keeping pressed the UP or DOWN keys, the scrolling speed will increase. The scrolling of the log is possible from any panel of the record, except "Delete last log" and "Delete all logs" panels.
- When scrolling the log, the number of the record is displayed for one second on the secondary LCD, together with "TAG" if the identification of the sampling location was made.

When the end of the log is reached, an error beep is heard.



RECORD VIEWING

Each record contains more information than the measured value. The additional information is grouped in several panels.

Press READ ► to scroll through the record panels. The record panels are displayed one by one in a circular way.

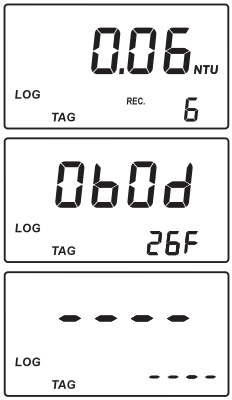
Each record contains the following panels:

- The record value (turbidity value) and record number.

Note: If the logged sample value is an over range reading, the maximum value (1000) will be displayed blinking.

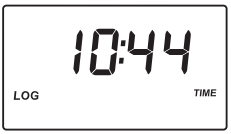
- The hexadecimal string of the tag for the sampling location ID.

Note: If the ID data are missing, dashes are displayed instead.



- Measurement date in YYYY.MM.DD format.

- Measurement time in hh:mm format.



- Delete the last record panel (only for last record).

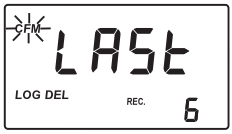
- Delete all records.

DELETE LAST RECORD

To log other values, the last record or all records have to be deleted.

- To delete the last record, press SETUP/DEL while in delete last records panel.

- The instrument asks for confirmation and if LOG/CFM is pressed, the last record is deleted. To abort the delete function, press READ ► instead of LOG/CFM.



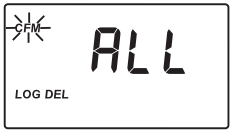
- After the record is deleted, the instrument goes immediately to the first panel of the previous record. If the log becomes empty, dashes will be displayed for one second and the instrument will return to idle mode.

DELETE ALL RECORDS

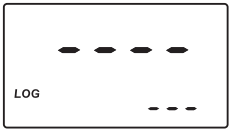
To delete all records, scroll the log until delete all records panel is displayed on the LCD.

- To delete all records press SETUP/DEL while in delete all records panel.

- The instrument asks for confirmation and if LOG/CFM is pressed, all records are deleted. To abort the delete function, press READ ► instead of LOG/CFM.



- After all records are deleted, dashes are displayed for one second and the instrument returns to idle mode.



GOOD LABORATORY PRACTICE (GLP)

The GLP feature allows the user to view last calibration data. Also, the user calibration can be deleted.

Press GLP ▲ to enter or exit GLP data consulting. Several functions are available when in GLP menu.

Press READ ► to scroll the following GLP data:

- The last calibration date, in YYYY.MM.DD format. If no calibration was performed, the factory calibration message, "F.CAL", will be displayed on the LCD.

or

- The time of the last calibration in hh:mm format.

- First calibration point: 0.00 NTU if skipped or the actual read value (e.g. 0.01 NTU).

or

- Second calibration point.

- Third calibration point (if available).

- Fourth calibration point (if available).

- Delete calibration panel.

To delete calibration:

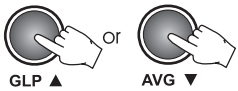
- Press SETUP/DEL while in the delete calibration panel of the GLP.
  The user calibration will be deleted and the factory calibration will be restored. The instrument will enter automatically in idle mode.

SETUP

Setup mode allows viewing and modifying the instrument parameters.
The blinking "CAL" tag during setup mode suggest to press CAL for parameters editing.

- To enter/exit SETUP, press SETUP/DEL.

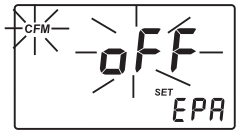
- To select the parameter to be edit, press UP or DOWN keys until the desired panel is displayed.



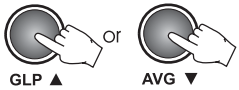
SET EPA COMPLIANCE MODE

When EPA compliance reading is ON, "EPA" message is displayed on the secondary LCD and the reported values are rounded to meet EPA reporting requirements.

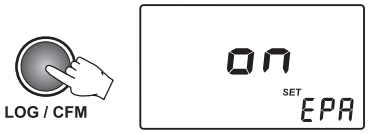
- To edit the EPA mode, press CAL when EPA compliance reading panel is displayed.
  The parameter setting and "CFM" tag will start blinking.



- Press the UP or DOWN keys to set ON or OFF the EPA compliance mode.



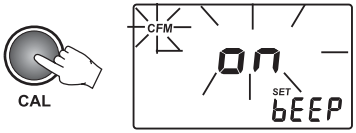
- Press LOG/CFM to save the setting. The new selected option of the parameter will be displayed on the LCD.
  Alternatively, press CAL to exit without saving the new settings.



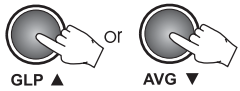
SET BEEPER

The **HI 98703** has a built-in beeper that signals the tag read, the key press and the error conditions. The beeper can be selected to be ON or OFF.

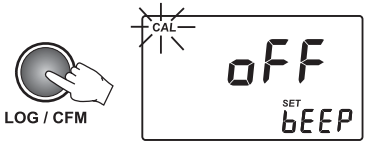
- To set the beeper ON/OFF, press CAL when set beeper panel is displayed.
  The beeper status and "CFM" tag will start blinking.



- Press the UP or DOWN keys to set the beeper ON/OFF.



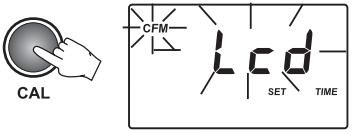
- Press LOG/CFM to save the change. The new selected option will be displayed on the LCD. Alternatively, press CAL to exit without saving the changes.



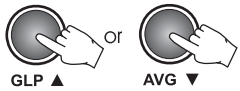
SHOW / HIDE THE TIME

You can choose between showing or hiding the current hour and minutes on the LCD.

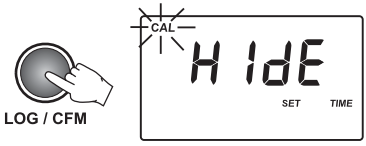
- To set hiding or showing the time, press CAL when show/hide time panel is displayed. The time show status and "CFM" tag will start blinking.



- Press the UP or DOWN keys to set lcd / hide for time.



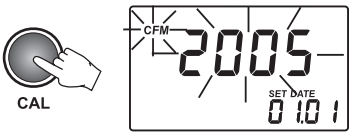
- Press LOG/CFM to save the change. The new selected option will be displayed on the LCD. Alternatively, press CAL to exit without saving the changes.



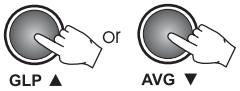
SET THE DATE

The **HI 98703** turbidimeter has a built-in real time clock (RTC). The RTC time is used to generate a unique time stamp for each recorded value and to automatically store the last calibration date. The current time can be displayed on the LCD when the instrument is in idle mode.

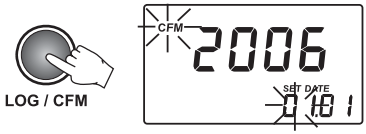
- To set the current date, press CAL when set date panel is displayed. The date format is YYYY.MM.DD. The last two digits of the year value and "CFM" tag will start blinking.



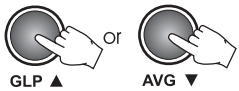
- Press the UP or DOWN keys to set the year value.



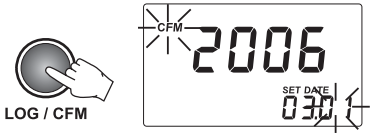
- Press LOG/CFM or READ ► to start editing the month value. The month value will start blinking.



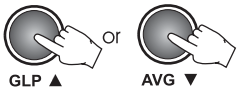
- Press the UP or DOWN keys to set the month value.



- Press LOG/CFM or READ ► to start editing the day value. The day value will start blinking.

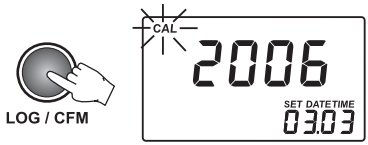


- Press the UP or DOWN keys to set the day value.



Note: To edit the year again, after the day was set, press READ ►.

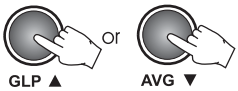
- Press LOG/CFM to save the new date. The new date will be displayed on the LCD. Alternatively, press CAL to exit without saving the changes.



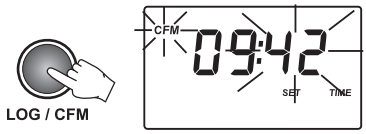
SET THE TIME

- To set the current time, press CAL when set time panel is displayed. The time format is hh:mm. The hour value and "CFM" tag will start blinking.

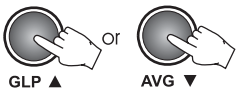
- Press the UP or DOWN keys to set the hour value.



- Press LOG/CFM or READ ► to start editing the minutes. The minutes value will start blinking.

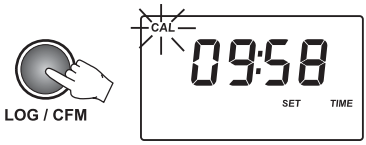


- Press the UP or DOWN keys to set the minutes value.



Note: To edit the hour again, after the minutes were edited, press READ ►.

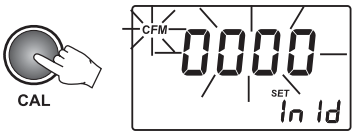
- Press LOG/CFM to save the new time. The new set time will be displayed.
  Alternatively, press CAL to exit without saving the changes.



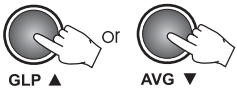
SET INSTRUMENT ID

The instrument ID is a four digit number that can be edited by the user. The instrument ID is downloaded on the PC application, together with the logged data. By setting a different ID for each instrument it is possible to mix information from many turbidimeters into the same database.

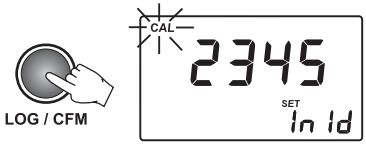
- To set the instrument ID, press CAL when set instrument ID panel is displayed.
  The default instrument ID is 0000. The existing ID value and "CFM" tag will start blinking.



- Press the UP or DOWN keys to set the new instrument ID. By pressing and holding the UP or DOWN keys, the changing speed wil increase.



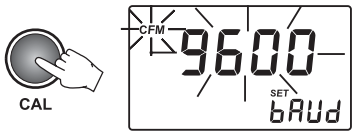
- Press LOG/CFM to save the change. The new instrument ID will be displayed.
  Alternatively, press CAL to exit without saving the changes.



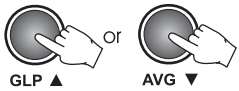
SET BAUD RATE

The **HI 98703** has a RS232 and a USB link. When the USB connection is used, the RS232 connection becomes inactive.
To successfully communicate with the PC, the same baud rate must be selected on the instrument and on the PC application. The available baud rates are 1200, 2400, 4800 and 9600.

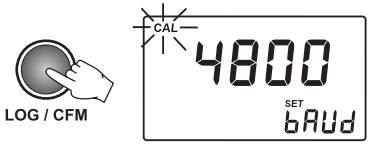
- To set the baud rate, press CAL when set baud rate panel is displayed.
  The parameter value and "CFM" tag will start blinking.



- Press the UP or DOWN keys to select the new baud rate value.



- Press LOG/CFM to save the change. The new selected baud rate will be displayed. Alternatively, press CAL to exit without saving the changes.



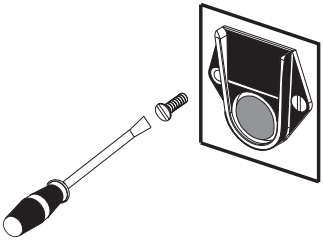
LCD BACKLIGHT

The LCD can be illuminated to allow the user to see the readings even in dark environments.
To turn ON or OFF the backlight, press LIGHT.
The backlight will automatically shut-off after 25 seconds of non-use to save the battery life.

TAG INSTALLATION

The tag is housed in a rugged metal that can withstand harsh environments. However, it is better to protect the tag from direct rain.

Place the tag near a sampling point. Fix it securely with the provided screws, in such a way that the metallic iButton® is easily accessible for reading the tag.



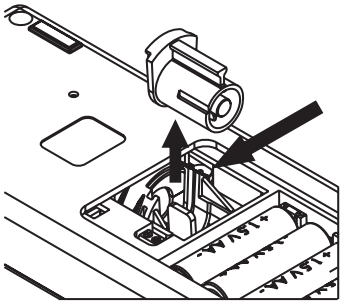
The number of tags that can be installed is practically unlimited. Additional tags can be ordered (**HI 920005** - five tag holders with tags).

LAMP REPLACEMENT

The instrument tungsten lamp has a life longer than 100,000 measurements. In case of lamp failure, the defective lamp can be easily replaced. When the lamp is broken, the instrument displays "no L" error message.

To replace the lamp follow the next steps:

- Remove the battery lid.
- Unscrew the lamp connection using a screwdriver.
- Unlock the lamp and extract it by pulling it out from the lamp holder handler.
- Place the new lamp in the right position and push it until is securely locked.
- Insert the lamp leads into the connector and tight them using a screwdriver.

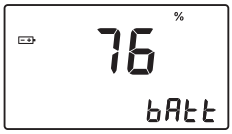


Warning: After lamp replacement the meter needs to be recalibrated.

BATTERIES MANAGEMENT

For field measurements, **HI 98703** is powered by 4 AA batteries. The battery life is enough for 1500 normal measurements.

When the instrument is started, the remaining battery life is estimated and reported in percents.



To preserve the battery it is better to use normal instead of averaged measurements.

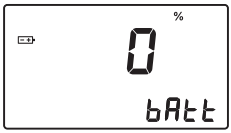
Continuous measurements keep the lamp on and should be used with caution if the battery life is an issue.

To further save the battery life, the instrument will turn off after 15 minutes of non-use. The backlight will be turn off after 25 seconds since the last key was pressed.

The battery life is measured each time the lamp is turned on and if the remaining battery life is less than 10%, the battery tag will be displayed blinking on the LCD to warn the user that the batteries need to be replaced.

When the batteries are completely discharged, "0% bAtt" message will be displayed for one second and the instrument will turn off.

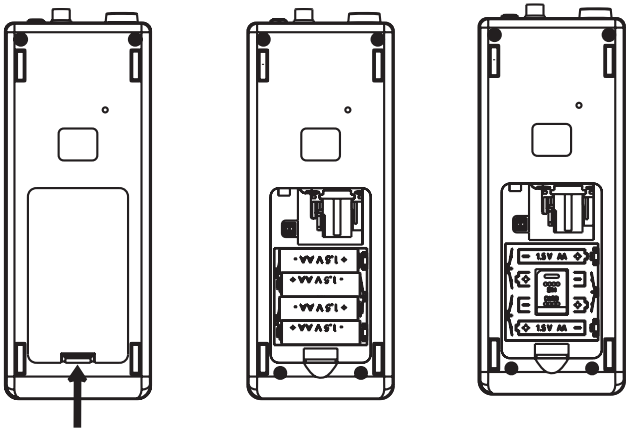
In order to use the instrument again, replace the batteries with new ones or use an AC adapter.



BATTERIES REPLACEMENT

To replace the batteries follow the next steps:

- Press ON/OFF to turn OFF the instrument.
- Open the batteries cover by pressing the locking clip.



- Take out the used batteries and insert 4 new 1.5 AA size batteries, while paying attention to the correct polarity as indicated on the battery compartment.
- Replace the cover and press it until it locks.
- Turn the instrument ON.

Warning: Replace batteries only in a non-hazardous area.

USING AN AC ADAPTER

The **HI 98703** can be powered from the AC adapter when used in laboratory. See the Accessories section to select the correct AC adapter.

To power the instrument, simply connect the AC adapter to the instrument (see Connectors Description, page 9).

It is not necessary to turn the instrument off when connecting the external adapter.

Note: The connection to the external adapter will not recharge the batteries.

PC INTERFACE

To fully use the instrument tag identification system function, the measured data has to be downloaded to a computer. The instrument can use RS232 or USB connection to communicate with the PC.

When using the RS232 protocol, simply connect a **HI 920011** serial cable between the instrument and the computer.

To use the USB protocol, simply connect a regular USB cable between instrument and PC.

In both cases, the PC must run the **HI 92000** application for successful data transfer.

ERROR CODES

HI 98703 has a powerful diagnostic system. The common errors are detected and reported for easy diagnostic and maintenance.

ERROR	DESCRIPTION	ACTION
Err1 – Err3; Err6; Err7; Err8	Critical errors. The instrument beeps and shuts down.	Call Hanna service
Err4	The instrument beeps shortly twice and shuts down after 10 seconds	Press simultaneously UP and DOWN to reset the EEPROM contents
CAP	The lid is not closed.	Close the lid. If the error persists, return the instrument.
no L	Lamp broken or no light.	Replace the lamp. Check the optical system for obstructions
L Lo	Not enough light.	Check the optical system for obstructions
-LO-	The standard used for current calibration point is too low	Check the standard and use the correct one
-HI-	The standard used for current calibration point is too high.	Check the standard and use the correct one
Battery tag blinking	The remaining battery life is too low	Replace batteries
bAtt	The batteries are too discharged for correct measurements	Replace batteries

ACCESSORIES

HI 93703-60	Caps for cuvets (4 pcs)
HI 710005	Voltage adapter from 115V to 12 VDC (USA plug)
HI 710006	Voltage adapter from 230V to 12 VDC (European plug)
HI 710012	Voltage adapter from 240V to 12 VDC (UK plug)
HI 710013	Voltage adapter from 230V to 12 VDC (South Africa plug)
HI 710014	Voltage adapter from 230V to 12 VDC (Australia plug)
HI 731318	Tissue for wiping cuvets (4 pcs)
HI 731331	Glass cuvets (4 pcs)
HI 740027P	1.5V AA battery (12 pcs)
HI 740231	Replacement lamp for EPA turbidimeter (1 pcs.)
HI 92000	Windows® compatible software
HI 920005	5 tag holders with tags
HI 920011	5 to 9 pins RS232 connection cable
HI 93703-50	Cuvets cleaning solution (230 mL)
HI 98703-58	Silicon oil (15 mL)

RECOMMENDATIONS FOR USERS

Before using this product, make sure that it is entirely suitable for your specific application and for the environment in which it is used.

Operation of this instrument may cause unacceptable interferences to other electronic equipments, requiring the user to follow all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid damage or burns, do not put the instrument in microwave ovens. For your own and the instrument safety do not use or store the instrument in hazardous environments.

SALES AND TECHNICAL SERVICE CONTACTS

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South Africa:
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USA:
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MAN98703
02/06

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