Construction Site Monitoring Program Guidance Manual

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California Department of Transportation
Division of Environmental Analysis
Storm Water Program MS 27
1120 N Street, Sacramento, California 95814
http://www.dot.ca.gov/hq/env/stormwater/index.htm

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1 INTRODUCTION

1.1 Purpose of Document

This manual presents guidance for California Department of Transportation (Caltrans) staff and contractors to use in the planning and implementation of stormwater monitoring programs at construction sites, in compliance with the State of California's Construction General Permit (CGP) issued by the State Water Resources Control Board (SWRCB): State Water Resources Control Board Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities as amended by Order 2010-0014-DWQ and 2012-006-DWQ, herein called the "Construction General Permit (CGP)," especially Sections I.J, I.K, IX, X, XI, and XII.

The CGP does not apply to discharges of stormwater within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Quality Control Board (RWQCB) has adopted its own permit to regulate stormwater discharges from construction activity in the Lake Tahoe Hydrologic Unit (RWQCB 6SLT; Caltrans Districts 3 and 10). Owners of construction projects in this watershed must apply for the Lahontan RWQCB permit, Order No. R6T-2011-0019, National Pollutant Discharge Elimination System (NPDES) No. CAG616002, rather than the statewide CGP. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), details of which are available online at: http://www.swrcb.ca.gov/rwqcb6/board_decisions/adopted_orders/2005/docs/r6t_2005_0007.pdf

State Water Resources Control Board Order No. 2012-0011-DWQ, NPDES Permit No. CAS000003, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California Department of Transportation (Caltrans) that was adopted on September 19, 2012, and took effect on July 1, 2013, known as the "Caltrans' Municipal Separate Storm Sewer System (MS4) permit," does not regulate discharges from Caltrans construction activities, including dewatering effluent discharges from construction projects. The nine RWQCBs throughout the state have different requirements for dewatering. Because of these requirements, dewatering discharges cannot be considered as an automatically authorized non-stormwater discharge through the CGP, but it may be authorized once the proposed discharge is reported, reviewed, and approved on a case-by-case basis by the appropriate RWQCB. Authorized non-stormwater dewatering

discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges.

This manual contains Construction Site Monitoring Program (CSMP) requirements based on:

- Caltrans Standard Specification
- Caltrans Standard Special Provisions

This manual is designed and organized to provide descriptions of the processes used to plan and implement a successful water quality monitoring program specific to runoff from construction sites. The manual directly addresses CGP requirements for the monitoring of stormwater runoff. The current version of the CGP that was adopted by the SWRCB on September 2, 2009, became effective on July 1, 2010. The CGP was amended by Order No. 2010-0014-DWQ on November 16, 2010, and was amended again on July 17, 2012.

The guidance provided in this manual complements Caltrans' *Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual* (Caltrans, 2011a), particularly the Caltrans *SWPPP Template* (Caltrans, 2012a). This manual should be used to complete SWPPP template Section 700 CSMP based on project specific information.

An important objective of this manual is to provide consistency in monitoring methods among Caltrans' various construction sites, as well as consistency in monitoring protocols over time. Such consistency is essential to ensure compliance with the CGP and provide for data comparability. It is also essential that monitoring data are collected in a manner to ensure that the data are accurate. Therefore, this manual features detailed information on quality assurance (QA) and quality control (QC) procedures.

The stormwater sampling and testing procedures in this manual are based on the Caltrans' general guidance manual for stormwater monitoring—*Caltrans Comprehensive Protocols Guidance Manual* (Caltrans, 2003b)—which provides more comprehensive guidance for planning and implementation of stormwater monitoring projects.

Because construction projects come in many sizes and configurations, each site must be addressed individually. The CGP makes essential distinctions by Risk Level, as described in Section 2 of this manual, and has separate requirements for active treatment systems (ATSs) (covered in Section 9) and Linear Underground/Overhead Projects (covered in

Appendix C). Caltrans oversight monitoring is described in Appendix E. It is the responsibility of the construction site Resident Engineer (RE) and the Contractor's Water Pollution Control (WPC) manager to evaluate each construction project and use this manual to develop a site-specific monitoring strategy in compliance with the CGP, and coordinated with the Caltrans' SWPPP requirements. For further guidance and/or direction about compliance with the CGP, the Caltrans' District Construction Stormwater Coordinator can be contacted.

The RE, as stated in the Caltrans Statewide Stormwater Management Plan (SWMP), is the Department's representative charged with administering construction contracts and is responsible for ensuring that stormwater controls are implemented on construction sites. The RE makes decisions regarding the acceptability of material furnished and work performed, and exercises contractual authority to direct the contractor. The RE may impose sanctions if the contractor fails to take appropriate actions specified in the contract to correct deficiencies. The RE must also ensure that inspectors and the contractor attend construction site stormwater training, and cooperate with the self-audit program (SWMP Section 8).

As stated in Section 13 of the Standard Specifications, the contractor must assign one WPC manager to implement the WPCP or SWPPP, whichever is applicable for the project. The WPC manager must be a QSP if the project requires a WPCP. The WPC manager must be a QSD if the project requires a SWPPP.

1.2 CGP Overview

The California SWRCB administers the federal NPDES Permit Program for stormwater runoff from construction sites through its statewide, General NPDES Permit. On September 2, 2009, the SWRCB re-issued the CGP under Order No. 2009-0009-DWQ (and amended by Order 2010-0014-DWQ and 2012-006-DWQ). Under the CGP, owners or managers of construction sites are called "dischargers," referring to the potential to "discharge" stormwater runoff from the construction site. Effective July 1, 2010, the permit requires dischargers whose projects disturb 1 acre of soil or more, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 acre or more, to obtain coverage under the CGP.

This manual addresses the monitoring requirements of the CGP and other monitoring requirements required by Caltrans. The CGP covers construction site stormwater management more broadly, including requirements for preparation of a SWPPP. The SWPPP includes measures for minimizing pollutants in stormwater runoff during and

after construction as well as monitoring. For further guidance on developing SWPPPs, refer to the *Caltrans SWPPP and WPCP Preparation Manual* (Caltrans, 2011). The CGP regulatory requirements vary depending on the risk level of the project. Risk level is determined by the risk determination, according to the anticipated discharge of sediment and the risk to receiving waters. The CGP establishes three levels of possible risk for a construction site (Risk Level 1, 2, or 3). A project's risk level is specified in the contract special provisions. The monitoring requirements for each risk level are summarized in Section 2.

1.3 Organization of the Manual

This manual is organized to assist Caltrans construction project contractors through the process necessary to develop and implement the CSMP in compliance with the CGP using the *SWPPP Template* (Caltrans, 2012a).

Section 1 provides a general introduction, purpose, and overview of this manual.

Section 2 provides general information on developing the CSMP.

Section 3 covers protocols for visual monitoring.

Section 4 covers information on CSMP implementation protocols.

Section 5 covers protocols for monitoring of non-visible pollutants.

Section 6 covers protocols for monitoring of non-stormwater discharges.

Section 7 covers protocols for monitoring of stormwater discharges (pH and turbidity).

Section 8 covers protocols for RWQCB-required monitoring.

Section 9 covers protocols for monitoring of ATS.

Section 10 covers protocols for monitoring of receiving waters.

Section 11 provides timeline information, as well as documentation and reporting requirements.

This guidance manual also includes:

- Section 12, sources to obtain more information
- Section 13, a glossary of terms used throughout the manual
- Section 14, a list of references used in the preparation of this manual
- Section 15, an alphabetical subject index
- Forms Instructions (Appendix A)
- Bottle and Equipment Cleaning Protocols (Appendix B)
- Linear Underground/Overhead Project Monitoring Requirements (Appendix C)
- Active Treatment System – CGP Monitoring Protocols (Appendix D)
- Caltrans Oversight Monitoring (Appendix E)

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2 CSMP OVERVIEW

2.1 Permit Requirements

The CGP requires preparation of a project-specific CSMP for each construction site prior to the commencement of construction activities. The CSMP must be updated as necessary on an ongoing basis to reflect project changes.

As required by the CGP, the CSMP is developed to address the following objectives:

- Demonstrate that the site is in compliance with the Discharge Prohibitions and applicable numeric action levels (NALs) and with the numeric effluent limitations (NELs) of the CGP for ATS.
- Determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives (WQOs).
- Determine whether immediate corrective actions, implementation of additional best management practices (BMPs), or SWPPP updates or amendments are necessary to reduce pollutants in stormwater discharges and authorized non-stormwater discharges.
- Determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in stormwater discharges and authorized non-stormwater discharges.

The CSMP must be developed by a Qualified SWPPP Developer (QSD), and the CGP allows the CSMP to be included as either an appendix or be included as a separate section in a project-specific SWPPP. The CGP requires that all projects appoint a QSD and a QSP for the construction project. A QSD and QSP (can be same person) must have CGP-required registrations or certifications, appropriate experience, attended a State Water Board-sponsored or approved QSD or QSP training course, passed the QSD or QSP exam, and obtained the QSD or QSP certificate. Only a QSD can write, amend, or certify a SWPPP. For Caltrans projects, only a QSD can implement the SWPPP; all inspection, maintenance repair, and sampling activities must be performed or supervised by a QSD.

Section 2 in this manual provides a summary of the elements that must be included within a project-specific CSMP. For Caltrans projects, the template for the CSMP is found in Section 700 of the SWPPP Template (Caltrans, 2012a). The WPC manager will oversee implementation of the CSMP.

Each project-specific CSMP must address the CGP monitoring and sampling requirements specified for the risk level designated for the project. In addition, each project-specific CSMP must address the Caltrans-required monitoring and sampling requirements specified in the Caltrans standard specifications and contract special provisions. Table 2-1 summarizes the monitoring requirements for each risk level.

The CSMP must include all monitoring procedures and instructions, location maps, forms, and checklists as required by the CGP. Templates and locations for the maps, forms, and checklists are provided in the Caltrans *SWPPP Template* attachments and appendices (Caltrans, 2012a). Records of visual observations and water quality monitoring (completed forms) must be included with the SWPPP and in the Annual Report.

The CSMP must cover all types of monitoring to be performed at the construction site, including:

- Visual Monitoring (Inspections[1]) of Sites
  - Routine (non-storm) Inspections
    - Daily Inspection
    - Weekly BMP Inspection
    - Quarterly Non-Stormwater
  - Storm-event Based Inspections
    - Pre-Storm
    - Daily During Storm
    - Post-Storm
- Water Quality Monitoring (Sample Collection and Testing)
  - Non-Visible Pollutants
  - Non-Stormwater Discharges (including dewatering discharges)
  - Stormwater Discharges (pH and turbidity)
    - Effluent

[1] Both routine daily and weekly site inspections of project BMPs are covered in Caltrans *Storm Water Pollution Prevention Plan Template* Section 600.2 Site Inspections.

Table 2-1. Summary of Monitoring Requirements.

Risk Level	Visual Monitoring (Inspections)						Water Quality Monitoring (Sample Collection/Testing)			
	Daily Inspection [1]	Weekly BMP Inspection	Quarterly Non-Stormwater	Pre-Storm[2,3]	Daily Storm BMP[4]	Post Storm[5]	Stormwater Discharge (pH and turbidity)[6,7]	Non-Visible Pollutants[10]	Non-Stormwater Discharge	Receiving Water[11,12]
1	✓	✓	✓	✓	✓	✓	[8]	✓	[8]	
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
3	✓	✓	✓	✓	✓	✓	✓[9]	✓	✓	✓

Notes:

[1] These daily inspections are required by Caltrans in addition to the Construction General Permit (CGP)-required weekly BMP and quarterly non-stormwater inspections. Both routine daily access road and weekly site inspections of project best management practices (BMPs) are covered in Caltrans *Stormwater Pollution Prevention Plan (SWPPP) Template* Section 600.2 Site Inspections.

[2] The CGP requires a pre-storm inspection within two business days (48 hours) prior to qualifying rain event* but because the size of a rain event cannot be predicted accurately, Caltrans has set an adequate trigger for a pre-storm event visual inspection to be the same as for a Rain Event Action Plan (REAP): 50 percent or greater probability of producing precipitation of 0.1 inch or greater within a 24-hour period in the project area based on the National Weather Service Forecast Office (National Oceanic and Atmospheric Administration).

[3] For Risk Level 2 and 3 projects, a REAP also must be developed by the Water Pollution Control Manager 48 hours prior to any forecasted storm event. The REAP must be made available on site and implementation begun no later than 24 hours prior to the forecasted storm event. Refer to the *SWPPP Template* (Caltrans, 2012a) for additional information.

[4] At least once each 24-hour period during any extended storm event.

[5] Within two business days (48 hours) after each qualifying rain event.* For stored or contained stormwater, observe discharge derived from a qualifying rain event.

[6] Minimum three samples from each representative sampling point (defined in Section 7.3) per day during a qualifying rain event.* For dewatering discharges, Caltrans requires that the turbidity of any sample must not exceed 200 NTU. The pH value of any sample must be within the range of 6.7 to 8.3 pH units.

[7] Submit results to Resident Engineer (RE) within 48 hours after storm event if either of the numeric action levels (NALs) is exceeded. RE submits results to State Water Resources Control Board (SWRCB) within 10 days after storm event if either of the NALs is exceeded. For Risk Level 3 projects, submit results to RE within 48 hours after storm event. RE submits results to SWRCB within five days after storm event. For projects with an ATS, if either of the numeric effluent limitations (NELs) are exceeded, submit results to RE within six hours of NEL exceedance being identified. RE submits results to SWRCB within 24 hours after NEL exceedance has been identified.

[8] In addition to the CGP-required non-visible pollutant sampling, Caltrans requires Risk Level 1 dischargers to also collect a minimum of three samples per day from discharges of accumulated stormwater or groundwater dewatering discharge and analyze for pH and turbidity.

[9] For Risk Level 3 projects with direct discharge into receiving waters, must also sample for suspended sediment concentration if turbidity daily average receiving water monitoring trigger is exceeded in previous effluent samples.

[10] If applicable; within first two hours of discharge from any storm event occurring during project working hours.

[11] When a receiving water monitoring trigger is exceeded and the Risk Level 3 site has a direct discharge into receiving waters, sample upstream and downstream of discharge in receiving water.

[12] Benthic macroinvertebrate bioassessment is required for projects disturbing 30 acres or more with direct discharge to a freshwater wadeable stream that is either: (a) listed by the SWRCB or United States Environmental Protection Agency as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or has the designated beneficial uses SPAWN & COLD & MIGRATORY. (Guidance on bioassessment monitoring is not included in this manual.)

* A qualifying rain event is any event producing precipitation of 0.5 inch, or greater, over the duration of the rain event.

    - Stored or Contained Stormwater
    - Conditional Monitoring (e.g., run-on)
    - Receiving Waters
  - RWQCB-required Monitoring
  - ATS Monitoring

2.2 Monitoring Plan Outline/Content

Specific content of the CSMP for each construction project includes both visual monitoring requirements and stormwater and non-stormwater monitoring requirements based on applicable sampling and analysis plans (SAPs). The CSMP content must include the following sections as applicable to the specific construction project:

A. Site Visual Monitoring Inspections
   - Visual Monitoring Locations
   - Visual Monitoring Schedule
   - Visual Monitoring Procedures
   - Visual Monitoring Follow-up and Tracking Procedures

B. Sampling and Analysis Plans
   - General
   - Non-Visible Pollutants
   - Non-Stormwater Discharges
   - Stormwater Discharges (pH and Turbidity)
   - Monitoring Required by RWQCB
   - ATS

The CSMP must include a general SAP and specific SAPs based on the specific construction project's risk level, RWQCB requirements, and project-specific activities (i.e., dewatering activities or ATS discharges). For example, for a Risk Level 1 project that does not have additional RWQCB requirements or an ATS, the CSMP must have a General SAP, a SAP for non-visible pollutants, and a SAP for non-stormwater discharges (accumulated stormwater or groundwater discharge only). Alternatively, some Risk Level 2 or 3 projects may require a general SAP and all five specific SAPs. The project's risk level is specified in the contract special provisions. Table 2-1 identifies the monitoring requirements that apply for each risk level. Other project-specific monitoring requirements placed upon the project by RWQCB would be identified in an Order or permit which should be included with the contract documents.

Each SAP, as detailed in Section 700 of the *SWPPP Template*, must include the following sections:

1. Scope of Monitoring Activities
2. Monitoring Preparation
3. Monitoring Strategy
4. Analytical Constituents (Non-Visible and Non-Stormwater SAPs only)
5. Sample Collection and Handling
6. Sample Analysis
7. Quality Assurance/Quality Control
8. Data Management and Reporting
9. Data Evaluation
10. Change of Conditions

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3 VISUAL MONITORING PROTOCOLS

3.1 Permit Requirements

Dischargers must conduct visual monitoring (inspections[2]) to comply with the CGP. A project's risk level determines the types of monitoring required. These inspections include:

- Caltrans requires that all areas or operations identified in Section 3.2.1 are inspected daily to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.
- All BMPs are inspected at least weekly to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.
- All project drainage areas are inspected quarterly to identify any non-stormwater discharges, including authorized and unauthorized discharges. These inspections must identify any evidence of the presence of flowing water or signs of recent flow during dry weather conditions.
- Pre-storm inspections are conducted to (a) evaluate the presence of spills, leaks, or uncontrolled pollutant sources; (b) assess BMP implementation; (c) evaluate stormwater storage and containment areas to detect leaks, ensure adequate freeboard, and document any pollutant characteristics; and (d) confirm proper rain gauge installation.
- BMPs are inspected daily during storms to identify BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.
- Post-storm inspections of BMPs are required to identify whether they have been properly implemented in accordance with the SWPPP. Post-storm inspections are required of stormwater discharges at all discharge locations. Discharges of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event must also be inspected.

Table 3-1 summarizes CGP Visual Monitoring requirements.

[2] Both routine daily access road and weekly site inspections of project BMPs are covered in Caltrans SWPPP Template Section 600.2 Site Inspections.

Table 3-1. Summary of Visual Monitoring Requirements.

Risk Level		Visual Monitoring (Inspections)				
	Daily Inspection[1]	Weekly BMP Inspection	Quarterly Non-Stormwater	Pre-Storm[2,3]	Daily During Storm[4]	Post Storm[5]
1	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓

Notes:
1 These daily inspections are required by Caltrans, in addition to the Construction General Permit (CGP)-required weekly BMP and quarterly non-stormwater inspections. Both routine daily access road and weekly site inspections of project best management practices are covered in Caltrans *SWPPP Template* Section 600.2 Site Inspections (Caltrans, 2012a).
2 Within two business days (48 hours) prior to each storm event. The CGP requires a pre-storm inspection prior to the qualifying rain event but because the size of a rain event cannot be predicted accurately, Caltrans has set an adequate trigger for a pre-storm event visual inspection to be the same as for a Rain Event Action Plan (REAP): 50 percent, or greater, probability of producing precipitation of 0.1 inch, or greater, within a 24-hour period in the project area based on the National Weather Service Forecast Office (National Oceanic and Atmospheric Administration).
3 For Risk Level 2 and 3 projects, a REAP must be developed by the WPC manager 48 hours prior to any likely storm event. The REAP must be made available onsite and implementation begun no later than 24 hours prior to the forecasted storm event. Refer to the *SWPPP Template* for additional information (Caltrans, 2012a).
4 At least once each 24-hour period during any extended storm event.
5 Within two business days (48 hours) after each qualifying rain event.*

* A qualifying rain event is any event producing precipitation of 0.5 inch, or greater, over the duration of the rain event.

3.2 How and What to Monitor

Inspections must occur only at times when climatic conditions (i.e., thunderstorms, high winds, etc.) do not present a health or safety hazard. If the required visual observations (inspections) are not performed due to dangerous weather conditions, provide an explanation for why the site inspection could not be conducted on the Stormwater Site Inspection Report form (CEM-2030).

Prior to performing a visual monitoring site inspection, review the following:

- SWPPP Attachment AA Water Pollution Control Drawings (WPCDs)
- Latest Monthly Stormwater Best Management Practices & Materials Inventory Report - Optional (CEM-2034)
- Latest Stormwater Site Inspection Report (CEM-2030)
- Stormwater Corrective Actions Summary form (CEM-2035) for the previous week, as applicable

Bring the following items with you on the inspection:

- A copy of the SWPPP Attachment AA WPCDs
- A daily logbook

- Blank copies of the forms to complete during the inspection

The Stormwater Site Inspection Report form (CEM-2030) and the Stormwater Corrective Actions Summary form (CEM-2035) (as applicable) must be completed, signed, and dated by the person performing the inspections.

The requirements for routine (non-storm) and storm-event-based inspections listed in Table 3-1 are each described in detail below.

Discharge Inspection Process

During any inspection identified in Table 3-1, any discharges or evidence of a prior discharge that could cause adverse conditions in the storm sewer system or the receiving water must be identified, recorded, and reported. Discharges requiring reporting include:

- Stormwater from a disturbed soil area discharged to a waterway without treatment by an effective combination of temporary erosion and sediment control BMPs.
- Non-stormwater, except conditionally exempted discharges, discharged to a waterway or a storm drain system, without treatment by an approved control measure (i.e., BMP).
- Stormwater discharged to a waterway or a storm drain system where the control measures (i.e., BMPs) have been overwhelmed or not properly maintained or installed.
- Discharge of hazardous substances above the reportable quantities in 40 Code of Federal Regulations (CFR) 110.3, 117.3 or 302.4.
- Stormwater runoff containing hazardous substances from spills discharged to a waterway or storm drain system.

If dry weather flow is observed (i.e., non-stormwater discharge) on the project site, the source of the discharge must be identified. For each non-stormwater discharge described, the discharge must be identified as an authorized or unauthorized non-stormwater discharge (see Section 3.2.2, Quarterly Non-Stormwater Inspections). Non-stormwater flows could originate from sources such as vehicle washing, chemical leaks and/or spills, or potentially illicit connections. If the source cannot be determined by visual observation, detailed testing that may include non-visible pollutant analyses should be performed. The source, quantity, frequency, and characteristics of the non-stormwater discharges and associated drainage area should be documented.

The Stormwater Corrective Actions Summary form (CEM-2035) must be completed if any of the following conditions requiring corrective actions are identified:

- To prevent any unauthorized discharge, including a discharge that can cause adverse conditions in the storm sewer system or the receiving water.
- To reduce or prevent pollutants (from a breach, malfunction, leakage, spill, or uncontrolled pollutant source) from contacting non-stormwater or stormwater discharges.
- To implement additional BMPs and/or restore proper operation of BMPs that are not properly installed, that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.

The RE must be immediately notified by the WPC manager of any discharge or evidence of a prior discharge that could cause adverse conditions in the storm sewer system or the receiving water. A written report, the Notice of Discharge form (CEM-2061), must be filed with the RE within 24 hours of the discharge event or discovery of evidence of a prior discharge that could cause adverse conditions in the storm sewer system or receiving water. The RE will decide if the discharge warrants an additional report to SWRCB. Adverse conditions include, but are not limited to, violations or threatened violations of WDRs, significant spills of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance. Caltrans will perform follow-up monitoring of major spills and/or perform confirmation sampling to ensure that threats to waters of the United States have been eliminated, as determined by the local RWQCB. Caltrans will notify the owner/operator of the Municipal Separate Storm Sewer System or the principal permittee as soon as practicable, but no later than 24 hours after onset of or threat of discharge that can cause adverse conditions in the storm sewer system or the receiving water. This requirement applies to any such discharge that is not covered by the California Emergency Management Agency procedures for discharges from a highway to a storm sewer system subject to a MS4 permit.

3.2.1 Daily Inspections

Caltrans Standard Specifications Section 13-1.03C requires daily inspections of the following:

- Storage areas for hazardous materials and waste under Standard Specifications Section 14-11.

- Hazardous waste disposal and transporting activities under Standard Specifications Section 14-11.
- Hazardous material delivery and storage activities.
- The following operations if activities occur on a daily basis:
  - Vehicle and equipment cleaning facilities.
  - Vehicle and equipment maintenance and fueling areas.
  - Verification that operators are inspecting vehicles and equipment for leaks and spills at the job site each day of use.
  - Demolition sites within 50 feet of storm drain systems and receiving waters.
  - Pile driving areas for leaks and spills if pile driving occurs daily.
  - Temporary concrete washouts if concrete work occurs daily.
  - Paved roads at job site access points for street sweeping if earthwork and other sediment or debris-generating activities occur daily. The Construction General Permit requires daily inspection of access roads for Risk Level 2 and 3 sites.
  - Dewatering work.
  - Active treatment system.
  - Work over water.

If the above items are not performed daily, then the BMPs must be inspected weekly and documented on the Stormwater Site Inspection Report form (CEM-2030).

Daily inspections must be performed to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.

On a daily basis contractor personnel will visually monitor the project site BMPs. BMPs must be inspected as described in Section 3.2.3.

3.2.2 Quarterly Non-Stormwater Inspections

Each drainage area must be inspected for the presence of authorized or unauthorized non-stormwater discharges and their sources. The inspection must be documented on the Stormwater Site Inspection Report form (CEM-2030). Each drainage area also must be inspected for indications of prior flow during dry weather conditions.

Authorized Non-Stormwater Discharges: The CGP authorizes certain non-stormwater discharges that may be necessary for the completion of construction projects. Authorized non-stormwater discharges may include those from dechlorinated potable water sources, such as fire hydrant flushing; irrigation of vegetative erosion control measures; pipe flushing and testing; water to control dust; uncontaminated groundwater from dewatering; and other discharges not subject to a separate NPDES permit adopted by a RWQCB. The CGP requires that authorized non-stormwater discharges must:

- Be infeasible to eliminate
- Comply with BMPs as described in the SWPPP
- Meet the NALs for pH and turbidity
- Not cause or contribute to a violation of water quality standards

All dewatering discharges from sedimentation basins must be filtered or treated, using appropriate technology. The appropriate technology must be selected based on potential pollutants and suspended sediment characteristics and concentration.

Some RWQCBs may require a separate NPDES permit or specific monitoring and reporting requirements for authorized discharges. Authorized non-stormwater dewatering discharges may require a permit because some RWQCBs have adopted General Permits for dewatering discharges. Check with the RE or the applicable RWQCB for requirements in the project area.

Unauthorized Non-Stormwater Discharges: Unauthorized non-stormwater discharges may not be discharged from the construction site. Examples of unauthorized non-stormwater discharges common to construction activities include:

- Vehicle and equipment wash water, including concrete washout water.
- Slurries from concrete cutting and coring operations, or grinding operations.
- Slurries from concrete or mortar mixing operations.

- Residue from high-pressure washing of structures or surfaces.
- Wash water from cleaning painting equipment.
- Runoff from dust control applications of water or dust palliatives.
- Sanitary and septic wastes.
- Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.

3.2.2.1 Non-Stormwater Discharge Inspection Process

Review the site map to determine the location and number of drainage areas and drainage area locations. Review the previous forms to determine if any non-stormwater discharges were noted on the Stormwater Site Inspection Report form (CEM-2030) or documented on the Notice of Discharge Report form (CEM-2061). Review the corrective actions and/or SWPPP revisions to determine if measures to address non-stormwater discharges were scheduled to be performed. Determine whether the corrective actions and/or SWPPP revisions were performed on schedule and record notes accordingly on the current quarter's form. If the actions were not performed on schedule, determine the reason and either revise the schedule or perform the actions immediately, if possible.

Observations must be made and recorded on the Stormwater Site Inspection Report form (CEM-2030) as follows:

1. Complete the header information on each page of the form.

2. Complete the General Information and Storm Information on page 1 of the form.

3. Respond to each item on the form with a check in the appropriate column for either "Yes" or "No." Include an explanation in the "Comments" column where applicable; these specific comments will allow more direct comparison over time to track results of stormwater pollution prevention efforts. Include a description of corrective actions taken or necessary to be performed. The form(s) must be signed and dated by the individual completing the observations.

4. Observe each drainage area for non-stormwater discharges, such as the presence of flowing water or signs of recent flow during dry weather conditions. If there is dry weather flow at the discharge location (i.e., non-stormwater discharge) during the inspection, the source of the discharge must be identified. For each non-stormwater discharge described, the discharge must be identified as an authorized

or unauthorized non-stormwater discharge. Non-stormwater flows could originate from sources such as vehicle washing or potentially illicit connections. If the source cannot be determined by visual observation, detailed testing should be performed. Document the source, quantity, frequency, and characteristics of the non-stormwater discharges and associated drainage area. Corrective actions must be taken to prevent any unauthorized discharge.

5. If any water is observed, document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).

6. Document if water samples are collected.

7. Observe the job site and job site perimeter for illicit connections and illegal discharges.

8. Document any corrective actions taken, the date the actions were performed or scheduled to be performed, and any SWPPP revisions necessary with the date the actions were performed or scheduled to be performed.

If dry weather flow is observed (i.e., non-stormwater discharge) on the project site, the source of the discharge must be identified. For each non-stormwater discharge described, the discharge must be identified as an authorized or unauthorized non-stormwater discharge (see Section 3.2.2, Quarterly Non-Stormwater Inspections). Non-stormwater flows could originate from sources such as vehicle washing, chemical leaks and/or spills, or potentially illicit connections. If the source cannot be determined by visual observation, detailed testing that may include non-visible pollutant analyses should be performed. Document the source, quantity, frequency, and characteristics of the non-stormwater discharges and associated drainage area.

For both stormwater and non-stormwater flow, BMPs treating the flow must be inspected to identify and record any BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Also identify, where applicable, the need to implement any additional BMPs.

3.2.3 BMP Inspections

Weekly, pre-storm, during-storm and post-storm visual monitoring inspections must be performed to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. These BMP inspections are in addition to inspecting and documenting on a daily basis the condition of specific BMPs

associated with activities specified in Section 3.2.1. BMPs are designed to eliminate or reduce the discharge of pollutants from construction sites to waters of the state. BMPs can be categorized as either Erosion and Sediment Control measures, or Construction Site Management measures.

Review the SWPPP to determine the locations of the BMPs. Determine if any corrective actions and/or SWPPP revisions were scheduled to be performed. Determine whether the corrective actions and/or SWPPP revisions were performed on schedule and record notes accordingly on the current form. If the actions were not performed on schedule, determine the reason and either revise the schedule or perform the actions immediately, if possible.

Observations must be made and recorded on the Stormwater Site Inspection Report form (CEM-2030) and the Stormwater Corrective Actions Summary form (CEM-2035), if applicable, as follows:

- Complete the header information on each page of the form.
- Complete the General Information and Storm Information on page 1 of the form.
- Inspect each BMP and respond to each item on the form with a check in the appropriate column for either "Yes" or "No." Include an explanation in the "Comments" column where applicable; these specific comments will allow more direct comparison over time to track results of stormwater pollution prevention efforts. Include a description of corrective actions taken or necessary to be performed. The form(s) must be signed and dated by the individual completing the observations.
- Photograph the BMPs as needed to document any identified problem areas.
- Document any corrective actions taken, the date the actions were performed or scheduled to be performed, and any SWPPP revisions necessary with the date the actions were performed or scheduled to be performed. If BMP failures or shortcomings are identified during the inspection, repairs or design changes to BMPs, as directed by the WPC manager, must be completed within 24 hours of identification, unless a longer period is authorized as per Caltrans Standard Specifications 13-1.03A. Document corrective actions on Stormwater Site Inspection Report Summary of Corrective Actions form (CEM-2035).

3.2.3.1 BMP Inspection Process

Erosion and Sediment Control BMPs. For Erosion and Sediment Control BMP visual monitoring, the Stormwater Site Inspection Report form (CEM-2030) guides the inspector to evaluate each type of BMP. The form asks BMP-specific questions such as:

- Is the BMP in the right location and is it properly installed? Refer to the SWPPP for information on the proper installation of BMPs selected for the project.
- Does the BMP require maintenance or repair? Inspections should determine if any maintenance activities are needed, such as:
  - Removing sediment from barriers and sedimentation devices.
  - Replacement or repair of worn, missing, or damaged sediment control devices such as silt fence fabrics or fiber rolls.
  - Replacement or repair of damaged structural controls (e.g., check for seepage, erosion and undercutting, structural soundness, damaged or obstructed inlet/outlet or spillway).
  - Repair of damaged soil stabilization measures; (e.g., mulch, hydroseeding, geotextiles and mats).
  - Other control maintenance as defined in the SWPPP or manufacturer's specifications.

The need for BMP repair or redesign can be determined by evaluating the BMP's effectiveness. For Erosion Control BMPs, determine if there are signs of visible erosion. For Erosion and Sediment Control BMPs, determine whether sediment was carried downstream of the BMP. In addition, BMP redesign may be required if grading operations at a site change the stormwater drainage patterns.

Construction Site Management BMPs. For Construction Site Management BMPs, the visual monitoring should be conducted to ensure that the BMPs were implemented and maintained according to the SWPPP. Construction Site Management BMPs may include vehicle and equipment fueling, maintenance, and cleaning; material and/or hazardous material storage; and waste management. The Stormwater Site Inspection Report form (CEM-2030) guides the inspector to evaluate each type of BMP by asking BMP-specific questions such as:

- Are areas protected from run-on and runoff? Are areas reasonably clean and free of spills, leaks, and other material?

- Are watertight containers and dumpsters properly located? Is litter and material waste placed in watertight dumpster?
- Are hazardous materials stored in properly labeled containers?
- Are concrete washout liners free from punctures and holes?

3.2.3.2 Weekly Inspections

The CGP requires weekly inspections be performed to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. These BMP inspections are in addition to Caltrans-required daily inspection of the condition of specific BMPs associated with activities specified in Section 3.2.1.

3.2.3.3 Pre-Storm Inspections

Pre-storm inspections are required to be conducted within two business days (48 hours) prior to each *forecasted* storm event. The CGP requires a pre-storm inspection prior to qualifying rain event but because the size of a rain event cannot be predicted accurately, Caltrans has set an adequate trigger for a pre-storm event visual inspection to be the same as for a REAP: 50 percent or greater probability of producing precipitation of 0.1 inch or greater within a 24-hour period in the project area based on the National Weather Service (NWS) Forecast Office (National Oceanic and Atmospheric Administration). The visual monitoring (inspections) must include:

- All stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources.
- All BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP.
- Any stormwater storage and containment areas to detect leaks and ensure adequate freeboard.
- The rain gauge to determine if it is operating properly and prepared to measure and record rainfall.

Review the site map to determine the location and number of the drainage areas. Review the SWPPP to determine the location and number of the BMPs. Review the previous storm's forms to determine if any corrective actions and/or SWPPP amendments were scheduled to be performed. Determine whether the corrective actions and/or SWPPP amendments were performed on schedule and record notes accordingly on the current

form. If the actions were not performed on schedule, determine the reason and either revise the schedule or perform the actions immediately, if possible.

For pre-storm visual monitoring inspections:

- Inspect each drainage area for any breach, malfunction, leakage, or spill of construction-related materials that could be exposed to stormwater. Document the presence and characteristics of any leaks, stains, sludges, odors, or other abnormal conditions. Document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).
- Inspect any stormwater storage and containment areas to determine any leaks and if there is adequate freeboard for storm event. If detained stormwater is present, document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).
- Inspect each BMP as described in the beginning of Section 3.2.3.
- Photograph the drainage areas and BMPs as needed to document any identified problem areas.
- Document any observations and corrective actions as described in the beginning of Section 3.2.3.

3.2.3.4 Daily During-Storm BMP Inspections

Daily storm BMP inspections must be performed at least once each 24-hour period during any extended rain events to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. See the beginning Section 3.2.3 for information on performing and documenting BMP inspections.

For during-storm visual monitoring inspections:

- Inspect stormwater discharges at each drainage discharge location. Document the presence and characteristics of any leaks, stains, sludges, odors, or other abnormal conditions. Document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).
- Inspect any stormwater storage and containment areas. Document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).

- Inspect BMPs as described in the beginning of Section 3.2.3.
- Document stormwater sample collection.
- Document observations as described in the beginning of Section 3.2.3.

3.2.3.5 Post-Storm Inspections

Post-storm inspections are required to be conducted within two business days (48 hours) after each qualifying rain event. The visual monitoring (inspections) must:

- Identify whether BMPs were adequately designed, implemented, and effective.
- Visually observe (inspect) stormwater discharges at all discharge locations.
- Visually inspect the discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event producing precipitation of 0.5 inch or greater at the time of discharge. Stored or contained stormwater that likely will discharge after operating hours due to anticipated precipitation must be observed prior to the discharge during operating hours.

Review the site map to determine the location and number of drainage areas. Review the SWPPP to determine the location and number of the BMPs. Review the forms completed for pre-storm and daily storm BMP inspections to determine if any corrective actions and/or SWPPP amendments were scheduled to be performed. Determine whether the corrective actions and/or SWPPP amendments were performed on schedule and record notes accordingly on the current form. If the actions were not performed on schedule, determine the reason and either revise the schedule or perform the actions immediately, if possible.

For post-storm visual monitoring:

- Inspect stormwater discharges at each drainage discharge location. Document the presence and characteristics of any leaks, stains, sludges, odors, or other abnormal conditions. Document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).
- Inspect any stormwater storage and containment areas. Document any pollutant characteristics (floating or suspended material, sheen, discoloration, turbidity, odor, etc.).
- Inspect BMPs as described in the beginning of Section 3.2.3.
- Document stormwater sample collection.

- Document observations and corrective actions as described in the beginning of Section 3.2.3.

3.3 Data Evaluation

3.3.1 Reviewing Results Regarding CGP Requirements

Visual monitoring (inspections) must be performed to assess compliance with the CGP and identify where corrective measures are needed.

3.3.2 Identifying Corrective Measures

Corrective measures must be implemented on an as-needed basis, as follows:

1. **Discharges:** Corrective measures must be implemented immediately following the discovery of a discharge that can cause adverse conditions in the storm sewer system or the receiving water. Corrective measures may include:
   - Repairing and restoring proper operation of failed or inadequately maintained BMPs.
   - Implementing additional, alternative, or redesigned BMPs.
   - Isolating any breach, malfunction, leakage, or spill by covering or containing them with BMPs.
   - Cleaning up leaks or spills.
2. **BMPs:** Corrective measures must be taken to restore proper operation of BMPs that are not properly installed, that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. If BMP failures or shortcomings are identified during inspections, repairs or design changes to BMPs (as directed by the WPC manager) must be completed within 24 hours of identification, unless a longer period is authorized in accordance with Caltrans Standard Specifications 13-1.03A. Corrective measures can include:
   - Removing sediment from barriers and sedimentation devices.
   - Replacement or repair of worn, missing, or damaged sediment control devices, such as silt fence fabrics or fiber rolls.
   - Replacement or repair of damaged structural controls (e.g., check for seepage, erosion and undercutting, structural soundness, damaged or obstructed inlet/outlet or spillway).

- Repair of damaged soil stabilization measures; (e.g., mulch, hydroseeding, geotextiles and mats).
- Other control maintenance as defined in the SWPPP or manufacturer's specifications.

3. **Spills, leaks, or uncontrolled pollutant sources:** Implement corrective actions to reduce or prevent pollutants from contacting non-stormwater or stormwater discharges. Corrective actions could include:
   - Removing the pollutant source by removing impacted soil, cleaning pavement, applying absorbent materials, then removing and disposing of absorbed materials.
   - Covering the pollutant source with methods such as tarps and closing lids.
   - Containing the pollutant source by implementing double containment, such as surrounding the source with a berm.
4. **Unauthorized non-stormwater discharges:** If dry weather flow is observed at a discharge location (i.e., non-stormwater discharge) during the inspection, the source of the discharge must be identified. Non-stormwater flows could originate from sources such as dust control measures or potentially illicit connections. If the source cannot be determined by visual observation, detailed testing that may include non-visible pollutant analyses should be performed. Document the source, quantity, frequency, and characteristics of the non-stormwater discharges and associated drainage area. For each non-stormwater discharge described, the discharge must be identified as an authorized or unauthorized non-stormwater discharge. Corrective actions must be taken to prevent any unauthorized discharge.
5. **Stormwater storage and containment areas.** Repair any leaks and perform any required maintenance.

3.3.3 Reporting

Complete the following forms for visual site monitoring inspections and submit to the RE as detailed in Section 11:

- CEM-2030 Stormwater Site Inspection Report
- CEM-2035 Stormwater Corrective Actions Summary (if required)
- CEM-2061 Notice of Discharge Report form (if required)

See Section 11 for detailed information on reporting and recordkeeping requirements.

4 CSMP IMPLEMENTATION PROTOCOLS

This section covers topics relevant to implementing the CSMP, including training, preparation and logistics, sample collection, QA/QC, laboratory sample preparation and analytical methods, QA/QC data evaluation, and data reporting. The information presented in this section was adapted from Caltrans' general guidance manual for stormwater monitoring, *Caltrans Comprehensive Protocols Guidance Manual* (Caltrans, 2003b), available on Caltrans' website at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-03-105.pdf.

4.1 General Information

4.1.1 Project Risk Level Determination

The CGP requirements vary depending on the risk level of the project. A project's risk level (Risk Level 1, 2, or 3) is determined by using the methodology described in the *Storm Water Quality Handbook - Project Planning and Design Guide* (PPDG) (Caltrans, 2010), and is then documented in the *Stormwater Data Report* (PPDG, Appendix E). The method involves first assessing a site's sediment risk (the relative amount of sediment that might be discharged, given the project and location details) and second, assessing the receiving water risk (the relative risk that sediment discharges pose to the receiving waters). The risk level is determined prior to obtaining coverage under the CGP and is included as part of the SWPPP (Section 500.1 in the *SWPPP Template* [Caltrans, 2012a]). A project's risk level is specified in the contract special provisions.

4.1.2 Timing – Monitoring During Project Working Hours and Safe Conditions Only

Visual monitoring and sample collection should be conducted only during scheduled project working hours (Caltrans equivalent of "site business hours" as specified in the CGP). Visual monitoring or sample collection should not be performed during dangerous weather conditions, such as flooding and electrical storms.

In addition, quarterly non-stormwater visual monitoring inspections must be conducted only during daylight hours (sunrise to sunset). This restriction may necessitate conducting quarterly inspections outside of project working hours.

If required monitoring was not conducted due to dangerous weather conditions or monitoring could not occur during project working hours, an explanation must be

provided on the Stormwater Site Inspection Report form (CEM-2030). The completed form(s) must be included in the SWPPP and in the Annual Report, and must document the reason(s) for not conducting visual monitoring and/or sample collection.

4.1.3 Who Should Monitor

All monitoring, maintenance, repair, and sampling activities must be performed or supervised by the WPC manager, who must be a QSD. A Qualified SWPPP Practitioner (QSP) may implement the SWPPP under the supervision of the WPC manager. A QSD and QSP will have undergone the training requirements specified in Section 4.3.

4.2 Monitoring Location Selection

Selecting locations for Caltrans construction site monitoring depends primarily on the type of monitoring (i.e., stormwater discharge, non-stormwater discharge, or non-visible pollutant) and the associated CGP requirements, as follows:

- ***Stormwater discharge samples*** must be collected from representative discharge points (defined in Section 7.3) where the construction site's stormwater flows off site. If there is reason to believe run-on may contribute to an exceedance of NALs or Receiving Water Monitoring Triggers, run-on also must be sampled.
- ***Non-stormwater discharges*** must be sampled from all discharge points where non-stormwater runoff is discharged off site. If there is reason to believe run-on may contribute to an exceedance of NALs or Receiving Water Monitoring Triggers, run-on also must be sampled.
- For ***non-visible pollutant sampling*** one grab sample must be collected at any discharge locations identified as potentially containing non-visible pollutants. In addition, one grab sample also must be collected of stormwater that has not come in contact with the disturbed soil or materials stored or used on site (uncontaminated sample), upstream/upgradient of the contaminated sample site.

Once the requirements for each type of monitoring have been determined, consideration of the following items will help ensure selection of the most appropriate monitoring locations:

- Representativeness
- Personnel Safety
- Site Access

- Site Selection Assessment

Each of these considerations is discussed in detail below.

4.2.1 Representativeness

Effective monitoring of construction sites requires selection of sampling locations that adequately represent runoff from the site prior to mixing with off-site sources. Select sampling sites that have the following characteristics:

- Monitoring sites should be located where runoff leaves the construction site, and where runoff from the site has combined to form a definable runoff stream of adequate depth to sample.
- Stormwater monitoring sites should be relatively fixed and stable (not subject to significant modification during construction), unless the project site physical drainage pattern is altered significantly during construction. Non-stormwater or non-visible pollutant sampling locations will likely vary.
- Discharge monitoring sites should be in an area of construction activity where the runoff stream well represents the flow and characteristics of the discharge.
- Monitoring sites should not be influenced significantly by construction equipment exhaust or be affected by surrounding land uses via atmospheric deposition or flows from non-Caltrans areas. For example, if possible, do not select sites close to agricultural fields that may be sprayed with pesticides that Caltrans uses, or industrial sites that may contribute airborne constituents, when deposition from those sites may affect onsite concentrations of monitoring project constituents.
- Monitoring sites should not be influenced by backwater, tidal conditions, or a high groundwater table (if groundwater reaches the surface and mixes with stormwater or non-stormwater runoff). If sampling dewatering non-stormwater discharges, it should be expected that the groundwater will be co-mingled.
- Discharge monitoring sites should be located where onsite runoff has not combined with runoff from offsite (non-Caltrans) sources.
- Discharge monitoring sites should be free of illegal discharges and illicit connections. An inspection of the site should include identification of any signs of illegal discharges, which generally include illegal discharge/dumping of wastes (used oil and other automotive fluids, trash and debris, etc.) and illicit connections of sanitary sewer lines to the storm drainage system. To adequately assess illegal

discharges and illicit connections, sites should be visited during dry weather to observe any non-stormwater runoff. The following onsite observations should be made to identify illegal discharges and illicit connections and recorded on the Stormwater Site Inspection Report form (CEM-2030):

- Presence of debris or rubbish piles on roadway shoulders, at turnouts, in open channels or other areas of the potential monitoring site. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way. Approach containers, such as bottles or barrels, with caution as they may contain hazardous materials.
- Visible signs of staining or unusual colors on the pavement or surrounding adjacent soils.
- Pungent odors coming from the drainage system.
- Discoloration or oily substances in the water, or stains and residues detained within ditches, channels or drain boxes.
- Abnormal water flow during dry weather, including irrigation tail waters.
- Unusual flows in sub-drain systems used for dewatering.
- Excessive sediment deposits, particularly adjacent to or near active offsite construction projects.
- In rural areas, also check for non-standard junction structures and broken concrete, disturbed soil, removed vegetation, or other disturbances at or near junction structures.

All observations should be documented for potential future use. If an illegal discharge or illicit connection is observed on a Caltrans right-of-way, the RE should be notified immediately. If the nature of an observed discharge is unknown or suspected of being a hazardous substance, no further investigation should be conducted and the incident should be reported immediately to the RE.

4.2.2 Personnel Safety

It is essential to ensure monitoring crew safety from such hazards as traffic, explosive or toxic gases, possible injury due to poor footing in slippery conditions, and hazards posed by poor visibility or other challenging conditions during adverse weather, especially at night.

Avoid locating sampling sites within the normal flow of either onsite construction traffic or the travel lanes of public rights-of-way.

The following is a general list of hazards that could be encountered at Caltrans monitoring sites; these hazards should be avoided or mitigated when selecting monitoring sites:

- Proximity to high-speed traffic
- Poor visibility at night or during adverse weather conditions
- Poor footing on slippery surfaces
- Confined spaces (access requires Occupational Safety and Health Administration certification)
- Explosive or toxic gases
- Uncovered water conveyances
- Heat – heat exhaustion, heat stroke
- Cold – exposure, frostbite
- Hazardous wildlife and plants
- People encountered on site who are unknown to field personnel

It is important to note that this is only a general, partial list of possible hazards that field personnel may encounter. It is imperative that experienced WPC managers and field technicians conduct a thorough investigation of each monitoring site to identify other possible hazards before the monitoring phase of a project begins.

To help avoid hazards, personnel should be physically capable of performing all tasks required for sample collection and be familiar with the site's Health and Safety Plan. The Health and Safety Plan must be developed prior to the initiation of any sample collection activities and should include information on at least the following: hazard evaluation (chemical, physical, etc.), contingency plan, personal protective equipment, and emergency information. Additional information regarding personnel safety during sample collection is provided in Section 4.6.1.

4.2.3 Site Access

Establish the ease of vehicular and personnel access to the monitoring locations for sample collection activities for the full range of weather conditions that may be

encountered, especially during wet-weather conditions. For example, ensure that the access point and available parking are at a safe distance from traffic, that any roads to the sampling location are adequate and reliable (e.g., limited potential to be muddy or flooded during wet weather), and that access does not require crossing private property. When in doubt, check with local agencies as to whether any permits will be required to gain legal access to the site(s). For stormwater outfall monitoring sites, access into the drainage line/outfall for sample collection must be safe and practical. Whenever feasible, access to monitoring locations should not involve confined-space entry or exposure to fast-moving traffic.

To ensure that personnel can quickly locate and access monitoring locations, clear directions and site maps should be developed that diagram site access for each monitoring location. In addition, a list of special access instructions should be included within the CSMP, including information regarding required keys for locks, traffic control requirements, necessary permits, etc.

4.2.4 Location Selection Assessment

Each potential monitoring location should be visited to confirm the expected site characteristics and verify whether the monitoring location is suitable for collecting samples. When possible, a visit should be conducted during or after a storm, when the discharge flow conditions can be observed. For some types of sampling (e.g., representative sampling locations for stormwater discharges), this visit could coincide with the pre-storm site inspection performed to develop the REAP. A wet-weather visit can provide valuable information regarding logistical constraints that may not be readily apparent during dry weather. However, a dry-weather visit should also be conducted to observe any non-stormwater flows, including evidence of any illicit connections or illegal discharges.

The site selection criteria should be reflected in the site selection assessment form, which should be completed during each monitoring location selection assessment visit. Figure 4-1 presents the Site Selection Assessment form.

Criteria to be documented during a site visit include type of discharge, physical configuration of site, drainage area characteristics, potential safety issues, site access, and whether any of the following are present: comingling of runoff from non-Caltrans sources, illegal discharges or illicit connections, nearby sources of atmospheric deposition, high groundwater, tidal influence, staining, or discoloration.

Figure 4-1. Location Selection Assessment Form.*

** example log only; specific site logs should be developed based upon program objectives*

Date _____ Name of person conducting site visit _____

District _____ Location _____ Post Mile _____

TYPE OF SITE:

Is the drainage area representative of the site? □ yes □ no

Describe: _____

TYPE OF RUNOFF FROM SITE:

Curb and gutter □ Overland flow □ Other□

Describe: _____

POTENTIAL SAMPLING LOCATION (WITH ACCESS TO FLOW):

Storm drain inlet	□	Ditch, swale	□
Culvert	□	BMP (e.g., retention basin)	□
Pipe	□	Other (describe) _____	□

Comments: _____

CLEAR CELLULAR PHONE RECEPTION AT SITE? □ yes □ no

Comments:

VEHICULAR SITE ACCESS? □ yes □ no

Describe: _____

PERSONNEL SAFETY ISSUES? □ yes □ no

(e.g., Proximity to traffic lanes, steep embankments, etc.)

Describe: _____

SITE CONDITIONS/OBSERVATIONS *(if yes, describe)*

Tidal influences ☐ yes ☐ no

_____

Illegal dumping ☐ yes ☐ no

_____

Illicit connections ☐ yes ☐ no

_____

High groundwater table ☐ yes ☐ no

_____

Runoff from landscaped areas ☐ yes ☐ no

_____

Adjacent commercial farming ☐ yes ☐ no

_____

Contributing run-on ☐ yes ☐ no

_____

Adjacent industrial sites ☐ yes ☐ no

_____

_____

Other observations:

_____

_____

_____

The information compiled in the Site Visit Log form should then be used to determine if the monitoring location is representative of the project site, and appropriate for meeting CGP requirements.

4.3 Training Requirements

Familiarity with the requirements of the CGP, the SWPPP and the CSMP, and competence in the techniques and protocols specified in those documents are essential for the collection of water samples in a manner that meets the requirements of the CGP, while protecting the health and safety of the field crewmembers. This section briefly describes the training necessary to provide monitoring personnel with the knowledge and skills to perform their assigned duties competently and safely. Training must be documented on the Stormwater Training Record (CEM-2023) and Stormwater Training Log – Optional (CEM-2024).

All of the contractor's field personnel must receive field monitoring training before conducting monitoring activities. The QSD, QSP, and WPC manager must have Caltrans-approved stormwater management training, as described on Caltrans' Construction Stormwater and Water Pollution Control website at:
http://www.dot.ca.gov/hq/construc/stormwater/

Because storm-related monitoring events are difficult to predict, and construction projects often last for a year or more, one or more members of the field crew may be unavailable to monitor a given event due to sick leave, vacation, etc. Thus, it is necessary to designate alternate field crewmembers who can fill in when primary members are unavailable. These alternate field crewmembers must receive the same training as the primary members in the event that a primary crewmember is unavailable.

4.3.1 QSD and QSP Training

All monitoring, maintenance, repair, and sampling activities must be performed by or supervised by the WPC manager, who must be a QSD. A QSP may implement the SWPPP under the supervision of the WPC manager.

4.3.2 Field Monitoring Training

Field monitoring training must include the following basic elements:

- SWPPP general review and a detailed review of Section 700 CSMP to become knowledgeable of project-specific CSMP requirements
- Health and Safety Plan review
- Field Training/Monitoring Simulation (Dry Run)

Review SWPPP, CSMP, and Health and Safety Plan. All field monitoring personnel and alternates should read the entire SWPPP which includes the CSMP developed for the construction site to obtain the background information required for an overall understanding of the project.

Monitoring personnel also should be made aware of potential hazards associated with sampling. These hazards can include slippery conditions, cold or hot temperatures, construction site traffic, and contaminated water. Crewmembers must read the Health and Safety Plan and become familiar with the methods to be employed to effectively handle those hazards.

Field Training/Monitoring Simulation (Dry Run). A training session should be held for all of the contractor's field sampling and testing personnel and alternates to review the monitoring techniques and protocols specified in the CSMP. Ideally, the training session should occur shortly before construction begins.

The contractor's training session should be organized in a chronological fashion, to follow the normal order of events from pre-monitoring preparations through post-monitoring activities. All standard operating procedures should be covered, along with the site-specific responsibilities of individual sampling and testing personnel. In addition, any questions arising from the document review should be addressed during this session.

Training personnel should circulate a copy of the SWPPP with the CSMP, and all other appropriate documentation during the training session. The following items should be available during a training session:

- Documentation (SWPPP, CSMP, forms, chain-of-custody, equipment manuals, etc.)
- Monitoring equipment
- Water, for demonstration purposes
- Sample bottles and example bottle labels

Key sections of the SWPPP, CSMP (SWPPP Section 700), and Health and Safety Plan should be highlighted during the training session, and use of equipment should be demonstrated. To emphasize the importance of minimizing sample contamination, special attention should be given to proper sample handling techniques. Ample opportunity should be provided to answer questions posed by field sampling and testing personnel.

The training should include a visit to the construction site where a monitoring simulation, or "dry run," can be conducted under the supervision of the WPC manager. During the "dry run," field sampling and testing personnel travel to their assigned monitoring locations and run through the procedures specified in the CSMP, including:

- Site access and parking at the site
- Implementing traffic control measures (if any)
- Knowing the location of personal protective equipment
- Calibrating field equipment
- Checking/preparing the monitoring stations
- Placing ice in ice chests for grab samples (if applicable)
- Conducting field measurements
- Completing sample bottle labels (if applicable)
- Collecting water samples (if applicable)
- Completing field log forms (including calibration)
- Completing chain-of-custody forms for each laboratory (if applicable)
- Packing samples on ice for transport to laboratory (if applicable)
- Delivering or shipping samples to the laboratory (if applicable)

All of the equipment and materials required for monitoring a storm event should be mobilized and used to simulate, as closely as possible, the conditions of an actual monitoring event. All field sampling and testing personnel (including alternates) should receive hands-on training with all field equipment and sample handling procedures. The WPC manager should re-emphasize health and safety considerations during the field monitoring simulation.

4.4 Preparation and Logistics

Adequate pre-storm preparations are essential for a successful monitoring event. Prior to deployment of field sampling and testing personnel and the initiation of monitoring, it is imperative that weather systems are adequately tracked, field personnel are prepared, and all necessary equipment is inventoried. Monitoring preparation and logistics should include the following basic elements:

- Weather tracking
- Communications
- Ordering sample bottles (if applicable)
- Preparing sample bottle labels (if applicable)
- Field preparations, including:
  - Implementing traffic control measures (if any)
  - Calibrating and maintaining field equipment as necessary
  - Checking/preparing the monitoring stations
  - Placing ice in ice chests for grab samples (if applicable
  - Completing sample bottle labels and chain-of-custody forms (if applicable)
  - Mobilization of field crews

The above-listed elements are discussed in the following subsections.

4.4.1 Weather Forecast Tracking

Weather tracking must be performed regularly to assist monitoring personnel in preparing for the arrival of rain. The WPC manager may need to use the forecast and project risk level as a basis to conduct a pre-rain inspection, prepare and implement a REAP, and prepare to conduct sampling activities. The WPC manager or other assigned contractor staff must be assigned to track weather conditions and evaluate potential storms.

- Weather forecasts provide the quantitative precipitation forecast (QPF) and the associated probability for each impending precipitation event. QPF is the amount of precipitation (in inches or centimeters) for the expected duration of the storm. The QPF is used to determine whether the predicted storm meets the Caltrans-specified criteria to conduct a pre-storm inspection and prepare a REAP, or the Caltrans' requirement for sampling for turbidity and pH each day of a qualifying rain event. These criteria are: Pre-storm inspection and REAP preparation: 50 percent, or greater, probability of producing precipitation of 0.1 inch of rainfall within 24 hours, and

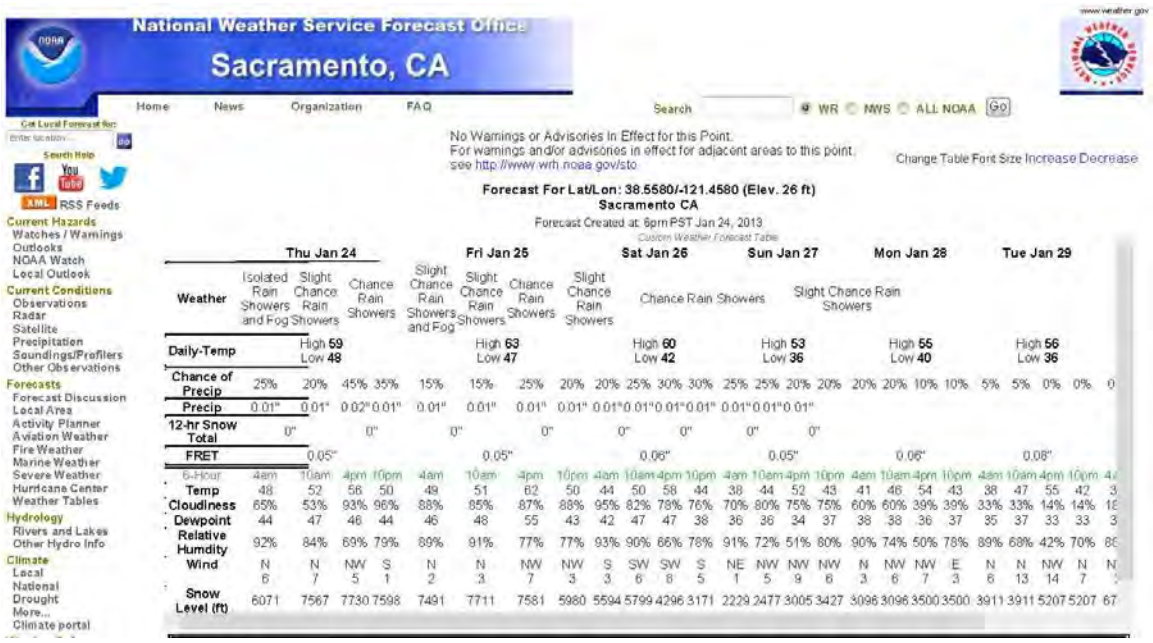
- Caltrans' requirement for sampling for turbidity and pH: each day the rain event is or is forecasted to be a qualifying rain event. The "qualifying rain event" is a single storm that produces at least 0.5 inch of rainfall. A qualifying rain event

may occur over multiple days. A rain event is considered to have ended when no measurable precipitation (i.e., less than 0.01 inch) is recorded within a consecutive 48-hour period.

The NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters, and ocean areas. NWS data are available for use by the general public through the NWS website at: http://www.nws.noaa.gov/.

Both written and graphical forecasts are available from the NWS website, along with a "Forecast Discussion" which provides additional information on model results and the logic behind the current forecast. The website also provides access to radar, satellite, and land-based weather station data. To obtain the percent chance of precipitation and the forecasted precipitation amount, at the NWS website, enter your zip code or city and state in the search box and click "go." Then, at the bottom right-hand portion of the page, under "Additional Forecasts & Information," click on "Forecast Weather Table Interface" to show both the percent chance of precipitation and the precipitation amount forecast. Figure 4-2 presents an example of a Forecast Weather Interface Table.

Figure 4-2. Forecast Weather Table Interface



To supplement forecasts from the NWS, private weather forecasting services can be contracted to provide custom forecast services for specific locations on a regular basis. Private weather forecasting services are also available on an on-call basis for telephone consultations regarding impending precipitation events. Additionally, information can be

obtained from weather news available on local television forecasts and The Weather Channel, as well as other sources available on the Internet.

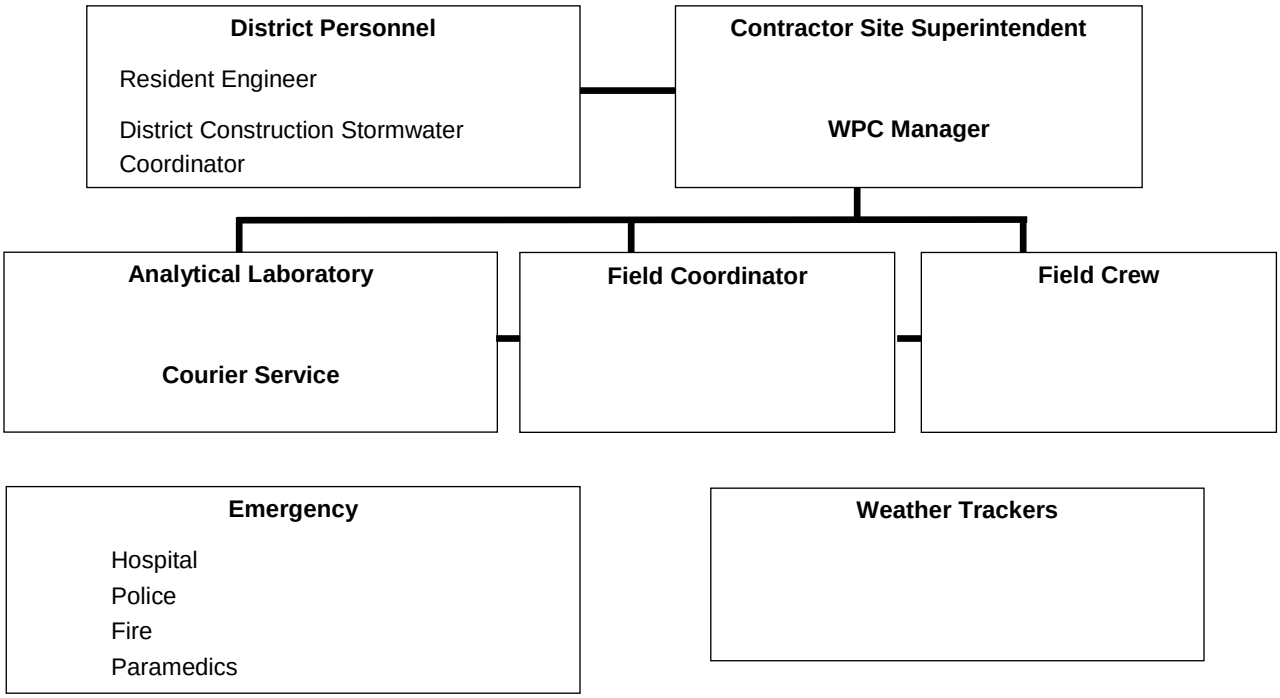
For time periods of up to one week prior to the arrival of a storm system, NWS model predictions and satellite imagery form the basis of the predictive information provided by NWS and private forecasters. As candidate storms approach, NWS radar observations and hourly reports from land-based NWS weather stations may be used to track and evaluate storm progress. Telephone communication with a contract forecaster is an effective way to access current information from these sources. As rainfall becomes imminent, observations from local field personnel can also be useful.

The WPC manager shall monitor the weather forecast on a daily basis for predicted precipitation within the following 96 hours. The WPC manager shall monitor and record the forecast at least daily for the next 24, 48, 72, and 96 hours to determine if the forecast for the probability of precipitation is 50 percent, or greater, for any 6-hour period. If the forecast for precipitation is 50 percent or greater, the WPC manager shall calculate the amount of precipitation forecasted for each 24-hour period and the total precipitation for the storm event and record the information. Weather forecast monitoring shall be filed in File Category 20.40: Weather Monitoring Logs.

4.4.2 Communications

A telephone tree should be developed to clearly define lines of communication and notification responsibilities. The telephone tree is used for site and monitoring preparation activities, personnel notification of forecasted events, communications during monitoring, and coordinating site and BMP evaluations following an event. The telephone tree should be attached to the REAP form (CEM-2045). The telephone tree graphically shows the notification sequence from the WPC manager to field water quality monitoring personnel. The telephone tree should list laboratory personnel numbers for the purpose of sample delivery. Emergency telephone numbers should be listed, including numbers of hospitals nearest the construction site. The telephone tree should include office, pager, cellular, home, and any other pertinent telephone numbers for each person involved in the project. It is essential that each person listed on the telephone tree have access to a copy of the telephone tree at all times during the monitoring season. Figure 4-3 presents an example of a telephone tree.

Figure 4-3. Telephone Tree.



4.4.3 Ordering Sample Bottles

For field-tested samples, bottles for samples should be ordered for collection of samples for field measurements, as needed in cases where the field meter probe cannot be inserted directly into the sample stream. The order should specify wide-mouth bottles, as grab sampling is easier to perform with wide-mouth bottles. Bottles are only used once and cannot be re-used.

For laboratory-tested samples, prior to the first sampling event, a sample bottle order is placed with the analytical laboratory. The laboratory provides clean bottles as part of their analytical services. The bottle order is based on all planned analyses that will be performed by the laboratory. Bottles are only used once and cannot be re-used. Enough bottles should be ordered to cover multiple events, accidental breakage or contamination, QA/QC samples, and potential non-stormwater sampling. If field blank samples are to be performed, the bottle order should also include blank water.

Field personnel must inventory sample bottles upon receipt from the laboratory to assure that adequate bottles have been provided to account for the expected analytical requirements. Immediately following each monitoring event, the bottle inventory should be checked and additional bottles ordered as needed.

Sample bottles and laboratory-cleaned sampling equipment must be handled only while wearing clean, powder-free nitrile gloves. Sample bottles must be stored in a clean area with lids properly secured.

Sampling Locations: As part of CSMP (SWPPP Section 700), the QSD must identify each of the potential sampling locations with a unique sample location identification code, as shown below. The identification code must start with a number and must be different for each location. If the construction site lies in a west-to-east orientation, starting with "01" from the east; the potential sampling locations shall be numbered toward the west. If the construction site lies in a south-to-north orientation, the potential sampling locations must be numbered toward the north (i.e., staring with "01" from the south). To further distinguish among the locations, the QSD must assign the following abbreviations to each potential sampling location based on the location type:

- Locations leaving Caltrans right-of-way: DL
- Discharge locations from areas with known non-visible pollutants: NVP
- Discharge locations upgradient of areas with known non-visible pollutants: UNVP
- Discharge locations to an MS4: MS
- Run-on locations: RO
- Discharge locations into a receiving water: RW
- Downstream of all discharge locations: RWD
- Upstream of all discharge locations: RWU
- Dewatering discharge locations: DDL
- Contained stormwater discharge locations: CSDL
- Discharge locations for ATS: ATS

The unique sample location identification code shall follow this format, SSSTTTTXX, where:

SSS = sampling location identifier number (e.g., 010)

TTTT = sampling location type (e.g., DL)

XX = identifier number for the type of sampling location

For example, the sampling location identification for the 15th sampling location based on starting from the south end of the project for a stormwater discharge location that has been identified to be the ninth discharge location would be 015DL09.

Sample Bottle Identification Labels: Sampling personnel shall assign a unique sample identification code, which shall follow this format, SSSSSYYMMDDHHmmTT, where:

SSSSS = sampling location identifier number (e.g., 01MS1)

YY = last two digits of the year (e.g. 11)

MM = month (01-12)

DD = day (01-31)

HH = hour sample collected (00-23)

mm = minute sample collected (00-59)

TT = Type or QA/QC Identifier (if applicable)

G = grab

FS = field duplicate

For example, the sample number for a grab sample collected at Station 01MS1, collected at 4:15 p.m. on December 8, 2011, would be 01MS11112081615G.

4.4.4 Sample Bottle Labels

Bottle labels should be prepared prior to each monitoring event. The laboratory typically provides blank bottle labels. Standard labels must be applied to each sample bottle that will be submitted to a laboratory for analysis. Labels should be completed to the extent possible and applied to sample bottles prior to the mobilization of field crews in the field. Pre-labeling of sample bottles simplifies field activities, leaving only date, time, and sample identification number to be noted on the label in the field. The laboratory should be able to provide pre-labeled bottles with water-proof labels that ample space for writing in site- and event-specific information. A standardized bottle label should include the following information:

- Project name
- Project number
- Site name

- Sample type (stormwater, non-stormwater, non-visible pollutants, etc.)
- Unique sample identification number
- Collection date/time
- Collected by: (names of field personnel)
- Preservative (if any)
- Analytical constituent(s)
- Each project site, monitoring location, and monitoring event should be assigned a unique identification number per the Caltrans naming guidelines described in the *SWPPP Template* (Caltrans, 2012a).

Custom bottle labels may be produced using blank water-proof labels and labeling software. Computer labeling programs can save a great deal of time in generating bottle labels. The sites and analytical constituent information can be entered in the computer program for each monitoring program in advance, and printed as needed prior to each monitoring event.

Because field blank and field duplicate samples are typically sent to the analytical laboratory "blind," bottle labels for these QA/QC samples must be completed with pseudonym site names and sample IDs. Actual QA/QC sample collection site information must be carefully noted in the field log. See Sections 4.9 and 4.10 for detailed QA/QC sample information.

Bottles should be labeled in a dry environment prior to sampling. Attempting to apply labels to sample bottles that are wet after filling will cause problems, as labels usually do not adhere to wet bottles, and it is difficult to write on wet labels. The labels should be applied to the bottles rather than to the caps. See Table 4-1 for required sample bottle types and preservatives that may be required on a project.

Table 4-1. Sample Collection, Preservation and Analysis.

Constituent	Analytical Method[1]	Sample Preservation	Minimum Sample Volume	Sample Bottle	Maximum Holding Time	Reporting Limit[2]
TPH-gasoline	EPA SW8015M	Store at 4˚ C, HCl to pH<2	40 mL	3 x 40 mL VOA-glass	14 days	50 mg/L
TPH-diesel	EPA SW8015M	Store at 4˚ C	500 mL	2 - 1 L Glass-Amber	7 days	50 mg/L
BTEX	EPA 624	Store at 4˚ C, HCl to pH<2	40 mL	3 x 40 mL VOA-glass	14 days	0.5 µg/L
VOCs-Solvents	EPA 624	Store at 4˚ C, HCl to pH<2	40 mL	3 x 40 mL VOA-glass	14 days	0.5- 50 µg/L
SVOCs	EPA 625	Store at 4˚ C	1 L	2 - 1 L Glass-Amber	7 days	0.05-.25 µg/L
Phenols	EPA 420.1	Store at 4˚ C	1 L	2 - 1 L Glass-Amber	7 days	0.1 mg/L
Pesticides	EPA 625	Store at 4˚ C	1 L	2 - 1 L Glass-Amber	7 days	0.1 µg/L
PCBs	EPA 625	Store at 4˚ C	1 L	2 - 1 L Glass-Amber	7 days	0.05-1.0 µg/L
Herbicides	EPA SW8151A	Store at 4˚ C	1 L	2 - 1 L Glass-Amber	7 days	Check Lab
Residual chlorine	SM 4500-Cl G	Do not expose to light (foil wrapped)	100 mL	250 mL Glass	15 minute	0.1 mg/L
Cations (barium, potassium, calcium, iron, sodium, magnesium)	EPA 200.7	Store at 4˚ C, HNO_3 to pH<2	100 mL	250 mL P	6 months	1 mg/L
Chloride	SM 4500-Cl B,C,D, or E	Store at 4˚ C	100 mL	250 mL P	28 days	1 mg/L
Sulfate	EPA300.0/SM 4110 B	Store at 4˚ C	100 mL	250 mL P	28 days	1 mg/L
TDS	SM 2540 C	Store at 4˚ C	100 mL	250 mL P	7 days	1 mg/L
BOD	SM 5210 B	Store at 4˚ C	600 mL	1 L P	48 hours	3 mg/L
COD	EPA 410.4/SM 5220 D	Store at 4˚ C, $H2SO_4$ to pH<2	100 mL	100 mL P	28 days	10 mg/L
TOC /DOC	SM 5310 C	Store at 4˚ C, $H2SO_4$ to pH<2	250 mL	250 mL Glass-Amber	28 days	1 mg/L
TKN (organic nitrogen)	SM4500-NH3 C	Store at 4˚ C, $H2SO_4$ to pH<2	50 mL	1 L P	28 days	0.1 mg/L
NO_3-N (nitrate – inorganic nitrogen)	EPA 300.0/SM 4110 B	Store at 4˚ C	100 mL	250 mL P	48 hours	0.1 mg/L

Table 4-1. Continued

Constituent	Analytical Method[1]	Sample Preservation	Minimum Sample Volume	Sample Bottle	Maximum Holding Time	Reporting Limit[2]
Phosphate, ortho	EPA 365.3	Store at 4° C	50 mL	100 mL P	48 hours	0.03 mg/L
pH	Field test with calibrated portable instrument; EPA Method 150.1	None	100 mL	250 mL P	15 min	+/- 0.2 pH units[4]
Turbidity	Field test with calibrated portable instrument; EPA Method 180.1	None	100 mL	250 mL P	48 hours	1 NTU
Temperature	Field test with calibrated portable instrument; SM 2550	None	100 mL	250 mL P	15 min (Immediate preferable)	+/- 0.1°C[5]
Dissolved oxygen	Field test with calibrated portable instrument; EPA Method 360.1	None	100 mL	250 mL P	Immediately	+/- 0.05 mg/L[5]
Specific conductance	Field test with calibrated portable instrument; SM 2510	Store at 4° C; filter if hold time > 24 hours	100 mL	250 mL P	28 days	+/- 1 µmhos/cm[5]
Total dissolved solids	SM 2540 C	Store at 4° C	100 mL	250 mL P	7 days	1 mg/L
Suspended sediment concentration	ASTM Method D 3977-97[3]	Store at 4° C	100 mL	250 mL P	120 days	5 mg/L
Alkalinity	SM 2320 B	Store at 4° C	100 mL	250 mL P	14 days	1 mg/L
Metals (Al, Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Ti, V, Zn)	EPA 200.8	Store at 4° C, HNO_3 to pH<2	100 mL	250 mL P	6 months	0.2 – 25 µg/L
Metals (Chromium VI)	EPA 218.6	Store at 4° C	50 mL	250 mL P	24 hours	1 µg/L
Coliform bacteria (total/fecal)	SM 9221 B/9221 C E	Store at 4° C, sodium thiosulfate ($Na_2S_2O_3$) in presence of chlorine	100 mL	100 mL Sterile P	6 hours	1 MPN/100 mL

Notes:

Adapted from Attachment S of the *SWPPP/WPCP Preparation Manual* (Caltrans, 2007a) and *Caltrans Comprehensive Protocols Guidance Manual* (Caltrans, 2003b)

[1] Alternative test procedures can be used if approved through the process specified in 40 Code of Federal Regulations part 136.

[2] Recommended reporting limits. Reporting limits can vary by analyte and by laboratory.

[3] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, ASTM D 3977-97 (2007), Vol. 11.02, pp. 389-394.

[4] Measured on a scale of 0-14; must be able to read within +/- 0.2 pH units.

[5] Must be able to report to +/- 0.1 of the nearest standard measurement unit.

°C = degrees Celsius

ASTM	=	ASTM International	NO_3	=	nitrate	Al	=	aluminum	Pb	=	lead
BOD	=	biochemical oxygen demand	NTU	=	nephelometric turbidity units	Sb	=	Antimony	Mn	=	manganese
BTEX	=	benzene, toluene, ethylbenzene, and xylene	P	=	polyethylene plastic	As	=	Arsenic	Mo	=	molybdenum
COD	=	chemical oxygen demand	PCB	=	polychlorinated biphenyl	Be	=	beryllium	Ni	=	Nickel
DOC	=	dissolved organic carbon	SM	=	standard method	Cd	=	cadmium	Se	=	selenium
EPA	=	United States Environmental Protection Agency	SVOC	=	semi-volatile organic compound	Cr	=	chromium	Ti	=	thallium
HCl	=	hydrochloric acid	SW	=	solid waste	Co	=	cobalt	V	=	vanadium
HNO_3	=	nitric acid	SWPPP	=	Stormwater Pollution Prevention Plan	Cu	=	copper	Zn	=	zinc
H_2SO_4	=	sulfuric acid	TDS	=	total dissolved solids						
L	=	Liter	TKN	=	total kjeldahl nitrogen						
µmhos/cm	=	micro mhos per centimeter	TOC	=	total organic carbon						
mg/L	=	milligrams per liter	TPH	=	total petroleum hydrocarbon						
µg/L	=	micrograms per liter	VOA	=	volatile organic analysis						
mL	=	milliliter	VOC	=	volatile organic compound						
MPN	=	most probably number	WPCP	=	Water Pollution Control Program						
$Na_2S_2O_3$	=	sodium thiosulfate	<	=	less than						

4.4.5 Field Equipment Preparations

Prior to the first precipitation event, and immediately after each monitored event, the field crews will inventory, restock, replace, clean, calibrate, maintain, and test field equipment as needed. Calibration solutions should be ordered if necessary. A standard checklist is used to perform an inventory of field equipment (tools, sample bottles, safety equipment, first aid kit, cellular telephone, etc.). Figure 4-4 presents an example field equipment checklist. Field equipment should be kept in one location, which is used as a staging area to simplify field crew mobilization.

Figure 4-4. Field Equipment Checklist.

- ☐ First aid kit
- ☐ CSMP (SWPPP Section 700)
- ☐ Log books/log sheets
- ☐ Chain of Custody forms
- ☐ "Rite-n-Rain" pens
- ☐ Umbrella
- ☐ Paper towels
- ☐ Coolers and ice
- ☐ Required grab sample bottles
- ☐ Spare bottle labels
- ☐ Parameter-specific field kits or electronic meters
- ☐ Permanent "Sharpie" Markers – fine point
- ☐ Weather–resistant camera
- ☐ Powder-free nitrile gloves
- ☐ Rubber bands / Duct tape
- ☐ Zip-lock baggies
- ☐ Cellular phone
- ☐ Hardhats /orange safety vests
- ☐ Personal rain gear
- ☐ Health and Safety Plan
- ☐ Sample collection equipment (extra bottles, bailers, etc.)
- ☐ Deionized or distilled water
- ☐ Laboratory wipes
- ☐ Safety goggles if sample preservatives are used

4.4.6 Mobilization for Monitoring

When a storm approaches that may generate a discharge, the WPC manager or other contractor staff assigned to track weather conditions will alert the field sampling and testing personnel and analytical laboratory. Field sampling and testing personnel will be given notice to mobilize when precipitation is imminent or has begun. For non-stormwater or non-visible pollutant monitoring, field sampling and testing personnel will be given notice to mobilize when conditions required for sampling are present. Field

crews may already be onsite conducting an inspection when non-stormwater or non-visible pollutant monitoring is required. The WPC manager should have a contingency plan to collect potential non-stormwater or non-visible pollutant samples prior to conducting site inspections (e.g., weekly, before, during, and after rain event, quarterly non-stormwater inspections). The contingency plan for sampling should include that stormwater inspectors are qualified as samplers or a sampler is available on short notice.

When first alerted, field sampling and testing personnel should consult their event sampling plan and check field equipment and supplies to ensure they are ready to conduct the required monitoring. Battery levels should be checked in all field equipment, and portable meters should be calibrated prior to commencing field measurements. For projects that require laboratory analysis of samples, the laboratory should be informed of incoming samples and field crew will need to obtain ice for sample preservation. Ice should be kept in ice chests for storage of filled grab sample bottles awaiting transport to the laboratory. Keeping ice in ziplock-type bags facilitates clean, easy ice handling. Refreezable ice packets are generally not recommended because they are susceptible to damage in transit and leakage

Once given the go-ahead, the field sampling and testing personnel will travel to the assigned monitoring locations and conduct final preparations for monitoring, including field equipment calibration.

4.5 Rainfall Measurement

The WPC manager shall have the primary responsibility to monitor weather at the project site. The WPC manager, on a daily basis, shall monitor the weather and record the weather conditions.

The CGP requires rain gauge readings to be measured and recorded for monitoring events. Rain gauge readings must be made and recorded from the onsite rain gauge before, during, and after precipitation events, and the event rainfall total must be computed for comparison to the Qualifying Storm (greater than or equal to 0.5 inch event total) and the Compliance Storm (see Section 7.6.1).

Precipitation can be measured using either a portable “direct-reading” rain gauge (graduated collector that is read manually) or an electronic “tipping bucket” rain gauge. Use of an electronic “tipping bucket” rain gauge is recommended whenever possible, due to improved accuracy and electronic recording of the data. This type of rain gauge collects rainfall in a small “bucket” in increments, usually 0.01 to 0.05 inch. The bucket

automatically tips and is emptied after each increment. The rain gauge is normally connected to a data logger, which counts the number of tips. Total rainfall is recorded automatically by the data logger.

If a portable, direct-reading rain gauge is used to collect precipitation data, field personnel must be present on site during the precipitation event to take periodic readings.

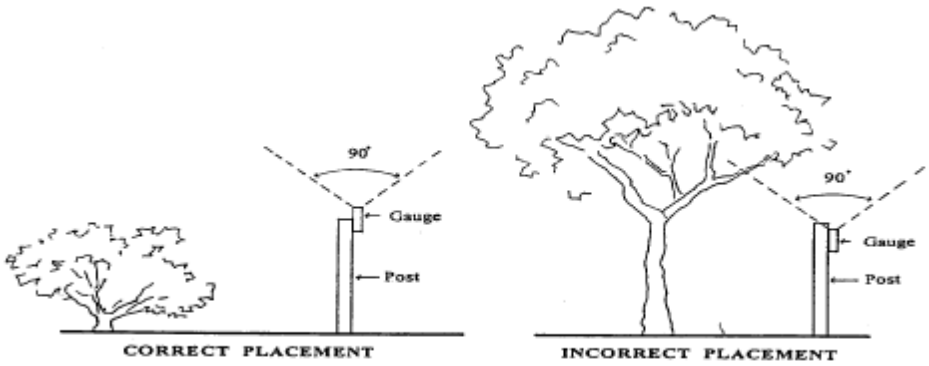
Rain gauges should be installed and maintained according to manufacturer specifications. Important installation factors include:

- Rain gauges must be installed in a secure fashion in a location where no buildings, trees, overpasses, or other objects obstruct or divert rainfall prior to entering the rain gauge.
- A rain gauge should always be placed in an elevated position (at least 4 feet above ground surface) so that activity on the ground (field technicians, animals, nearby traffic) does not splash water or debris into it.
- Rain gauges must be positioned so that the openings are horizontal and level.
- Rain gauges must be installed securely so that they maintain the secure position throughout the study; this is often accomplished by securing the gauge to a post or other object that will not bend in high winds.

The rain gauge should be installed over undisturbed land at least 4 feet above the ground surface. In areas having an accumulation of over 0.5 meters of snow per year, the rain gauge should be raised at least 12 inches above the usual seasonal total snow level. In addition, wind obstructions should not be closer than two to four times the obstruction height, and objects with a height of over 3 feet that deflect wind should not be located less than 16.5 feet away from the collector. The rain gauge must be positioned in an area clear of obstruction with a 45-degree angle of clearance all around the gauge (see Figure 4-5 for an illustration of the required imaginary 90-degree cone of clearance above the meter).

Typical rain gauges do not operate in freezing conditions. Heated rain gauges may be used in colder climates where alternating current power is available. Rain gauges using antifreeze are also available, but are susceptible to malfunction in high-wind situations. As such, rain gauges using antifreeze must be mounted securely to safeguard against disturbance by strong winds.

Figure 4-5. Required Rain Gauge Clearance.



Source: The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment State Water Resources Control Board, 2010.

Electronic rain gauges typically are mounted on top of rigid metal pipe. Wiring that connects the gauge to a monitoring station enclosure is run through this pipe and additional metal conduit as necessary to protect it against vandalism and the elements.

To function properly, rain gauges must be frequently maintained. The most common issue is fouling of the tipping bucket apparatus by bird droppings, leaves, or other materials. The gauge should be inspected prior to every potential monitoring event and cleaned as necessary.

The rain gauge must be calibrated following the manufacturer specifications, at a minimum prior to each stormwater monitoring season. The gauge should be recalibrated following any instance of fouling from bird dropping or other materials, and at any time that anomalous readings are observed.

Weather monitoring must be documented. Completed weather monitoring documentation must be kept in File Category 20.40: Weather Monitoring Logs. Within two working days of the last date shown on a completed weather monitoring documentation, a copy must be submitted to the RE.

4.6 Sample Collection

For storm events, the selection of the actual sampling locations for non-visible pollutants by the WPC manager will be documented. At least 48 hours before each qualifying rain event, the WPC manager must prepare a list of locations that must be sampled for the forecasted qualifying rain event.

Field measurements will be made for pH and turbidity (and other field-tested parameters such as chlorine) at each monitoring location during each rain event, and where necessary, grab sample(s) will be collected for laboratory analysis for other parameters. Field measurements may be made by directly submerging the probe in the discharge stream, or by collecting a sample aliquot for immediate measurement in the field. Field measurements and grab sample collection times will be recorded on the standard field forms (e.g., Stormwater Sample Field Test Report, CEM-2052).

The CGP requires samples to be collected, maintained, and shipped in accordance with the Surface Water Ambient Monitoring Program (SWAMP) 2008 Quality Assurance Project Plan (QAPrP). Additional information regarding SWAMP's QAPrP is available online at:
http://www.waterboards.ca.gov/water_issues/programs/swamp/ and at:
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

The CGP also requires that all sample collection and sample preservation be performed in accordance with the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, current version).

The following elements pertain to sample collection and handling:

- Personal safety
- Sample containers and volumes
- Clean sampling techniques
- Grab sample collection
- Sample preservation
- Sample delivery/chain-of-custody

These elements are described in the subsections below.

4.6.1 Personal Safety

Before samples are collected, field personnel must ensure that samples can be collected safely at each sampling location. Personal safety should be considered when selecting monitoring sites, as described in Section 4.2, above. Field personnel must be trained in site health and safety requirements and be trained in sample collection and safety protocols. All monitoring activities must be supervised by the WPC manager. Sample

collection should not be performed during dangerous weather conditions, such as flooding and electrical storms. Adherence to the following recommendations will minimize risks to field personnel:

- Only personnel properly trained and equipped for confined space entry may enter a space designated as "confined" (such as a manhole or standpipe).
- At no time during storm conditions or when significant flows are present should field personnel enter a manhole or standpipe.
- Two-person field crews should be available for all fieldwork to be conducted under adverse weather conditions, or whenever there are risks to personal safety.
- Personnel must be trained regarding appropriate traffic control measures, and appropriate traffic control measures must be employed in accordance with the project SWPPP, CSMP, and Health and Safety Plan.

4.6.2 Sample Containers and Volumes

Appropriate sample bottles and equipment must be used for each parameter to be measured. Use of improper bottles and equipment can introduce contaminants and cause other errors, which can invalidate the data. Table 4-1 specifies sample bottles and volumes required for each analysis.

Sampling devices must be made of chemically resistant materials that will not affect the quality of the sample. In general, sampling devices should be constructed of one of three materials: Teflon, glass, or polyethylene. These materials are known to be the most inert in terms of adsorption or desorption of organic and inorganic compounds, although both glass and plastic are subject to certain use limitations, depending upon the type of constituent being measured, as discussed below.

Polyethylene or glass sampling equipment and bottles can be used for collection of samples for analysis for pH, turbidity, and other conventional pollutants, including solids and nutrients. All sampling equipment used for trace metals determinations must be nonmetallic and free from any material that may contain metals. Acceptable materials include Teflon, polyethylene, and borosilicate glass (e.g., Pyrex). All sampling equipment used for trace organics determination must be glass or Teflon. Borosilicate glass is generally adequate when analysis is to be performed for a mixture of organic and inorganic constituents (such as metals). All sampling equipment used for bacteriological determination must be sterile.

Sampling equipment can include items such as scoops, bailers, grab poles, or other items designed to lower an appropriate sample container into the runoff flow. ***All grab sampling equipment which directly contacts the sample during or after collection must be compatible with the specific constituents to be analyzed***, as discussed previously. Sample collection equipment that is constructed of plastic or stainless steel may be Teflon-coated to make it suitable for use in stormwater monitoring.

Immediately prior to the filling of grab sample bottles, the bottle labels should be checked, and site- and event-specific information added using a waterproof pen. Attempting to label grab sample bottles after sample collection is not advised, as it is difficult to write on wet labels.

4.6.3 Clean Sampling Techniques

Stormwater sampling must employ "clean" sampling techniques to minimize potential sources of sample contamination, particularly from trace pollutants. Care must be taken during all sampling operations to minimize exposure of the samples to human, atmospheric, and other potential sources of contamination. Care must be taken to avoid contamination whenever handling bottles and lids.

For projects that sample for field parameters (i.e., turbidity, pH, dissolved oxygen, and conductivity), sample bottles/equipment must be cleaned according to the protocols presented in the *Standard Operating Procedures for Manual Field Measurement of Turbidity, pH, Dissolved Oxygen, and Conductivity* (Caltrans, 2012b). For example, turbidity meter sample cells must be rinsed with deionized water after use.

For projects that require laboratory analysis of samples, clean sample bottles must be ordered from the analytical laboratory prior to each stormwater monitoring event. Sample bottles must be prepared by the laboratory as specified by analytical method protocols. This includes the addition of sample preservatives where applicable. See Table 4-1 for specific bottle and preservative requirements. Sample bottles should be stored in a clean environment with lids securely on until the time of use.

Reusable sampling equipment used to collect samples for field parameters (e.g., turbidity and pH) must be cleaned according to the protocols presented in the *Standard Operating Procedures for Manual Field Measurement of Turbidity, pH, Dissolved Oxygen, and Conductivity* (Caltrans, 2012b). New and disposable sampling equipment, such as disposable plastic bailers, do not need to be cleaned prior to use. Disposable sampling equipment cannot previously have been used for any other purpose and can only be used

once and then discarded. Reusable sampling equipment that most frequently comes in contact with the sample includes any reusable grab sampling device, such as a stainless-steel bailer.

Any reusable sampling equipment that comes in contact with samples that will undergo laboratory analysis (e.g., trace organic and inorganic parameters) must be cleaned according to the following protocols as described in the *SWPPP Template* (Caltrans, 2012a):

1. Clean with tap water and a detergent (either a standard brand of tri-sodium phosphate detergent, such as Alconox® detergent, or a standard brand of phosphate-free laboratory detergent, such as Luminox® detergent), and use a brush, if necessary, to remove particulate matter and surface films. Equipment may be steam cleaned (detergent and high-pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. Plastic items should not be steam cleaned.
2. Rinse thoroughly with distilled water.
3. Final rinse with distilled water.

More extensive clean sampling techniques may be required under certain conditions, such as monitoring to assess receiving water impacts. See Appendix B for a detailed description of more extensive clean sampling techniques. Whenever possible, grab samples should be collected by opening, filling, and capping the sample bottle while submerged, to minimize exposure to airborne particulate matter. Note that sample bottles containing preservatives cannot be submerged. Additionally, whenever possible, samples should be collected upstream and upwind of field personnel to minimize introduction of contaminants. To reduce potential contamination, sample collection personnel must adhere to the following rules while collecting stormwater samples:

- No smoking during or immediately before or after sample collection.
- Never sample near a running vehicle. Do not park vehicles in immediate sample collection area (even non-running vehicles).
- Always wear clean, powder-free nitrile gloves when handling bottles, containers, and lids.
- Never touch the inside surface of a sample bottle or lid, even with gloved hands.

- Never allow the inner surface of a sample bottle or lid to be contacted by any material other than the sample water.
- Never allow any object or material to fall into or contact the collected sample water.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles.
- Do not eat or drink during sample collection.
- Do not breathe, sneeze, or cough in the direction of an open sample bottle.

4.6.4 Grab Sample Collection

Manual grab sampling techniques will be used to collect samples. A grab sample is an individual sample collected at one specific location at one point in time. Analysis of a grab sample provides a "snapshot" of the water's quality. Grab samples will not be composited for this program. Samples may only be collected when discharge locations can be safely accessed.

Water quality in stormwater runoff may vary both laterally and vertically throughout the cross-section of flow, and with time. For instance, floatable materials (oil, grease, light particles and debris, scum) may be present in significant amounts near the water surface, while heavier sediments are often concentrated near the bottom of the conveyance. Also, concentrations of some constituents may be higher in the first hour or two of runoff; this scenario is often referred to as a "first flush" effect. During the course of a storm, rainfall intensity also may increase, raising runoff flow rates to the point where sediments are mobilized and scour occurs, resulting in temporarily higher concentrations of sediment and sediment-bound constituents.

Manual grab samples are typically collected by direct filling of each individual sample bottle in the sample stream, or by use of an intermediate container to collect the sample. To collect samples, the flows will need to be at least 1 centimeter or 0.5 inch in depth. Overland sheet flows may not reach this depth. For sheet flows, an intermediate container such as a second (unpreserved) sample bottle can be used to collect multiple sample aliquots to fill a single sample bottle. To collect shallow or sheet flows the intermediate container must be placed as close to the ground as possible without touching the ground. Samples from areas of sheet flow can be collected using the collection procedures shown in the video at: http://www.youtube.com/watch?v=AmEJUNp44aU.

For collection of sheet flow samples using an intermediate container, an appropriate container or sample collection equipment must be used as specified in Section 4.6.2. For most analytical constituents, borosilicate glass (Pyrex) is an appropriate container. Other sample collection devices, such as an open-handle dustpan, may be used if they are fully Teflon-coated (or polyethylene for pH or turbidity sampling). Sandbags and other unapproved collection equipment may not be used for sample collection as such materials may contaminate samples. Refer to Section 4.6.2 for a list of approved materials. Keep the sediment in suspension during transfer of each sample aliquot by stirring or swirling the container. Otherwise, a portion of the sediment may settle out in the intermediate container and not be included in the sample that will be analyzed.

A grab pole can be employed as a means to extend the sample bottle or container out or down into the flow. The pole is designed so the sample bottle or container can be attached to the end.

As described in Section 4.6.2, sample collection devices must be made of chemically resistant materials that will not affect the quality of the sample. It is important to evaluate each component used to collect a sample for possible sources of sample contamination. Intermediate containers or sampling devices cannot be used to collect samples for oil and grease.

The sampling location should be approached from downstream. Samples or field measurements must be collected facing upstream to avoid stirring up sediment or otherwise affecting the sample water. Sample bottles should be filled to the top. Where possible, grab samples should be collected by completely submerging the bottle or container below the surface of the water, to avoid collecting any material floating on the surface. When submerging the bottle, avoid hitting the bottom of the conveyance, as this may disturb the sediment and impact the sample. If hitting the bottom cannot be avoided due to water depth, lower the bottle slowly into the water to minimize the disturbance.

When the sample bottle can be fully submerged, the bottle should be opened at the last possible moment and the lid screwed back on immediately after the sample is collected. The lid should be handled carefully during this time to avoid contaminating the inner lining. For sample bottles without preservatives, hold the lid around the rim and face it down. If possible open and close the bottle under water when collecting a sample. Do not touch the inside of the bottle or lid. The outside of the bottle must also be clean before sample collection.

Samples for pH and turbidity analyses may be collected in the same manner as grab samples, as described above. If flow depth is sufficient, and site conditions allow safe access, the pH and turbidity field meter probe may be inserted into the sample stream for direct measurement, without collection of grab samples for those analytes. In either case, analyze samples for pH and turbidity immediately in the field.

4.6.5 Sample Preservation

All samples that will be sent to a laboratory are kept on ice or refrigerated to 4 degrees Celsius from the time of sample collection until delivery to the analytical laboratory. The grab samples are placed in an ice chest filled with ice in the field *immediately following collection*. In addition to keeping the samples cool, it is also important to minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample, resulting in unreliable analytical results. Therefore, all samples are covered or placed in an ice chest with a closed lid immediately following collection.

Note that analyses for pH and turbidity are to be performed in the field immediately following sample collection; therefore, these samples are not placed on ice.

Sample bottles for nutrients, metals, and some volatile organics may contain acid or other chemical preservatives. Laboratories clearly mark each bottle if it contains a preservative. Normally, the volume added is very small, such as 1 or 2 milliliters, so the actual preservative may be hard to see. Do not rinse or over fill sample bottles that contain a preservative. Use an intermediate container to carefully fill these bottles. Do not submerge the bottle in the flow. Rinsing and overfilling the bottle may flush out the preservative or dilute it to the point where it will no longer be effective.

Be careful when handling bottles that contain acid. Spilling the acid can cause burns to the skin and eyes or damage clothes. Flush the area with water if an open bottle containing an acid preservative is accidentally spilled.

4.6.6 Laboratory Sample Delivery/Chain-of-Custody Form

All samples must be kept on ice, or refrigerated, from the time of onset of sample collection to the time of receipt by laboratory personnel. If samples are being shipped to the laboratory, place sample bottles inside coolers with ice, ensure that the sample bottles are well packaged to prevent breakage, and secure cooler lids with packaging tape. It is imperative that all samples be delivered to the analytical laboratory and analysis begun

within the maximum holding times specified by laboratory analytical methods (see Table 4-1). The holding times for water quality analyses range from six hours to six months. To minimize the risk of exceeding the holding times for bacteria (6 hours), biochemical oxygen demand (48 hours), and nutrients (48 hours), samples must be transferred to the analytical laboratory as soon as possible after sample collection. The field sampling and testing personnel must in such cases coordinate activities with the analytical laboratory to ensure that holding times can be met. Special arrangements for the laboratory to work the weekend may be necessary.

Chain-of-custody for samples is to be filled out by the field sampling and testing personnel for all samples submitted to the analytical laboratory. The purpose of chain-of-custody forms is to keep a record of the transfer of sample custody and the requested analyses. Sample date, sample location, and analyses requested are noted on each chain-of-custody form.

Any special instructions for the laboratory should also be noted, such as specifications of laboratory QC requirements (e.g., laboratory duplicate samples and matrix spike/matrix spike duplicate [MS/MSD] samples; see Section 4.8).

Chain-of-custody forms should be checked by the WPC manager to ensure that all analyses specified by the sampling plan are included. When chain-of-custody forms are reviewed immediately following a precipitation event, the WPC manager is able to address any field notes and notify the laboratory of additional analyses or provide necessary clarification. Copies of chain-of-custody forms are filed to the appropriate SWPPP file category.

4.7 Field Measurements

Analysis of pH and turbidity must be performed in the field by monitoring personnel using portable field meters, immediately after sample collection. The measurements are made according to the test methods, detections limits, and reporting units specified in Table 4-2. Field measurements must be performed according to the manufacturer's specifications for the field measurement device employed. For pH, the meter will be equipped with a probe-mounted sensor. For turbidity, the meter may have either a probe-mounted sensor or require filling a cuvette or sample cell with a separate sample aliquot that is read by the turbidity meter. If required by RWQCB, other common field parameters may also be measured in the field, such as electrical conductivity, dissolved oxygen, and temperature.

Table 4-2. Test Methods, Reporting Limits, Reporting Units, and Applicable NALs and Receiving Water Monitoring Triggers.

Parameter	Test Method/ Protocol	Discharge Type	Reporting Limit	Reporting Units	Maximum Holding Time	Numeric Action Level[5]	Receiving Water Monitoring Trigger[6]
pH	Field Test with calibrated portable instrument	Risk Level 2 and 3[4]	0.2[1]	pH units	15 minutes	Lower NAL = 6.5 Upper NAL = 8.5	Lower Trigger = 6.0 Upper Trigger = 9.0
Turbidity	Field test with calibrated portable instrument	Risk Level 2 and 3[4]	1	NTU	48 hours	250 NTU	500 NTU
SSC[3]	ASTM Method D 3977-97[2]	Risk Level 3 with direct discharge to receiving water (if turbidity receiving water monitoring trigger is exceeded)	5	mg/L	120 days	N/A	N/A

Notes:
[1] Measured on a scale of 0-14; must be able to read within +/- 0.2 pH units.
[2] ASTM, 1999, *Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials*, ASTM D 3977-97 (2007), Vol. 11.02, pp. 389-394.
[3] SSC is not a field measurement. Samples must be collected, preserved, and analyzed according to Table 4-1.
[4] In addition to the CGP-required non-visible pollutant sampling, Caltrans requires Risk Level 1 dischargers to also collect a minimum of three samples per day from discharges of accumulated stormwater or groundwater dewatering discharge and analyze for pH and turbidity.
[5] For dewatering discharges, Caltrans requires the turbidity of any sample must not exceed 200 NTU. The pH value of any sample must be within the range of 6.7 to 8.3 pH units.
[6] For Risk Level 3 projects with direct discharge to receiving water only.

ASTM = ASTM International
N/A = not applicable
NAL = numeric action level
NTU = nephelometric turbidity unit
SSC = suspended sediment concentration

Field measurements may be made by inserting the probe directly into the sample stream, or by using a clean container to collect a sample for measurement. When site conditions require collection of a sample for field measurement, a clean laboratory sample bottle may be used at each site to avoid cross contamination. Field measurements are made immediately, under ambient temperatures, without placing the samples on ice. The United States Environmental Protection Agency (EPA) requires pH measurements to be performed within 15 minutes of sample collection. The field meter probes must be thoroughly rinsed in the field after each measurement, using laboratory-supplied, reagent grade, deionized water. Deionized water can be carried into the field and applied using a plastic squirt bottle dedicated to the purpose.

The pH is a measure of the acid/base condition of water, and technically represents the negative logarithm of the hydrogen ion concentration. It is measured on a scale of 0-14 pH units, where pH below 7 is acidic, 7 is neutral, and above 7 is basic or alkaline.

Field measurement of pH should be performed using a portable meter equipped with a glass electrode in which the electrolyte solution can be replaced. Such electrodes provide more reliable measurement of surface water pH than plastic, gel-filled electrodes, and the replaceable electrolyte allows for maintenance to ensure long-term reliability. Because the accuracy of field pH measurement depends principally upon the condition of the electrode, the probe must be scrupulously maintained according to manufacturer specifications. Note that glass electrodes are fragile and care must be taken not to break the electrode in the field. Turbidity is a measure of the cloudiness of water, or, more accurately, the degree to which a water sample becomes less transparent as a result of the presence of suspended matter. The most common cause of turbidity in stormwater is suspended sediment, although other materials such as phytoplankton and algae can also contribute to the turbidity of a stormwater sample.

The instrument used to analyze turbidity is called a nephelometer; the units of a turbidity measurement are nephelometer turbidity units (NTUs). Nephelometers are commonly referred to as turbidimeters.

When using a turbidity meter that does not have a probe-based sensor, a turbidity sample is poured into a clean cuvette or sample cell and placed into the meter. The meter is activated and light is shined through the sample. The meter then measures light transmission through the sample, and computes turbidity in NTUs.

Field meters must be calibrated and maintained according to manufacturer's specifications to ensure accurate measurements. Calibration records for pH and turbidity

must be reported on form CEM-2052 Stormwater Sample Field Test Report. Calibration records for specialty meters must be recorded on the Stormwater Meter Calibration Record – Specialty Meters (CEM-2058 for conductivity, dissolved oxygen, or other parameters).

4.8 Laboratory Analysis

Laboratory analyses must be conducted according to test procedures approved by EPA under 40 CFR Part 136, unless other test procedures have been specified in the CGP or by RWQCB. With the exception of field analysis for turbidity and pH, and any other parameters for which field analysis is specified, all samples should be sent to a laboratory certified for the relevant analyses by the State Department of Health Services (DHS). All testing laboratories must receive samples within 48 hours of sample collection unless otherwise required by the laboratory or EPA protocols (e.g., bacteria samples must be delivered to the laboratory within six hours of sample collection), and samples must be collected only in appropriate sample containers as provided by the laboratory.

When the project includes requirements for analysis of samples by analytical laboratories, several steps must be undertaken to make the necessary arrangements with the laboratories, and to ensure that laboratories are prepared for monitoring events. The following topics are discussed below:

- Laboratory selection and contracting
- Pre-sampling preparations
- Analytical methods, including holding times and reporting limit (RL) requirements
- Laboratory data package deliverables

4.8.1 Laboratory Selection and Contracting

Important considerations in selecting an analytical laboratory include location, past performance, ability to meet analytical RLs, ability to meet all analytical holding times, laboratory report turn-around time, and experience with stormwater and other types of samples that will be generated by the monitoring program.

DHS certification is required for laboratory analytical work. A list of state-certified laboratories that are approved is available online at:
http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm.

4.8.2 Pre-Sampling Preparations

The analytical laboratory will be involved in a number of activities prior to the actual analysis of samples, including:

- Determination of key laboratory performance requirements (e.g., analytical methods, maximum RLs, and turnaround times) for analytical services contract.
- Discussion of the data quality evaluation procedures, QC sample schedule/frequency, and QC sample volumes.
- Providing clean sample containers, blank water, and other equipment/support as needed.
- Coordination with field sampling and testing personnel prior to each anticipated storm-based monitoring event, including number of samples anticipated, approximate date and time of sampling and sample delivery (if known), and when sample containers will be required.

4.8.3 Analytical Methods

Samples typically will be analyzed for one or more of the constituents presented in Table 4-1. Required analytical method, sample bottle type, target RL, volume required for analysis, sample preservation, and maximum holding time are presented for each analyte in Table 4-1.

The recommended analytical methods shown in Table 4-1 are specified by EPA in 40 CFR 136 and also described either in *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, current version) or in the listed EPA method.

Samples must be analyzed within established holding times to ensure reliability and validity of the results. Maximum acceptable holding times are method-specified for various analytical methods. The holding time starts for each individual grab sample when it is collected, and the time is counted until analysis of the sample. If a sample is not analyzed within the designated holding times, the analytical results may be suspect. Prompt analysis also allows the laboratory time to review the data and, if analytical problems are found, re-analyze the affected samples.

The RL is the minimum concentration at which the analytical laboratory can reliably report detectable values. The RL varies by analyte and can vary by laboratory. It is

important to ensure that the RLs produced for the project are low enough to provide useful results. The RLs listed in Table 4-1 match the RLs recommended by Caltrans in the *Caltrans Comprehensive Protocols Guidance Manual* (Caltrans, 2003b).

4.8.4 Laboratory Data Package Deliverables

As a part of the laboratory contract, the data package that will be delivered to the contractor and the timing of its delivery (turnaround time) should be defined. The data package should be delivered in hard copy and electronic copy (typically on compact disc).

The hard copy data package should include a narrative that outlines any problems, corrections, anomalies, and conclusions, as well as completed chain-of-custody documentation. A summary of the following QA/QC elements must be in the data package: sample analysis dates, RLs, results of method blanks, summary of analytical accuracy (MS recoveries, blank spike recoveries, surrogate compound recoveries), and summary of analytical precision (comparison of laboratory split results and MSD results, expressed as relative percent difference [RPD]). Because the laboratory must keep the backup documentation (raw data) for all data packages, raw data (often called Contract Laboratory Program data packages) should not be requested.

In addition to the hard copy data report, an electronic copy of the data can be requested from the laboratory. The electronic copy includes all the information found in the hard copy data package. Data should be reported in a standardized electronic format.

Common turnaround times for laboratory data packages are two to 3 weeks for faxed or emailed (PDF format) data and 3 weeks to 30 days for hard copy and electronic copy. Receiving the faxed or emailed data quickly allows an early data review to identify any problems that may be corrected through sample re-analysis.

4.9 QA/QC – Field Measurements

The quality of analytical data is dependent on the ways in which samples are collected, handled, and analyzed. For field measurements, QA/QC measures pertaining to field testing that should be included in the CSMP include:

- Daily calibration of field meters prior to use during each monitoring event
- Maintenance of field meters – especially probes
- Thorough rinsing of probes between measurements

- Field duplicates of field measurements

Daily calibration of field meters (prior to any monitoring event) is an essential part of QA/QC for field measurements (see details in Section 4.7).

Proper maintenance of field equipment—particularly probes—is also essential. Follow manufacturer's specifications for maintenance; replace probes as needed.

The field meter probes must be thoroughly rinsed in the field after each measurement, using laboratory-supplied, reagent grade, deionized water. Deionized water can be carried into the field and applied using a plastic squirt bottle dedicated to the purpose.

Duplicate Field Measurements. To verify the precision of field measurements, duplicate measurements must be conducted in the field on not less than 1 in every 10 samples. The duplicate measurements should be performed in rapid succession in the field, from duplicate samples collected side-by-side or in rapid succession from the same spot. If the measurement is made by inserting the probe into the discharge flow, the duplicate measurements should be made in rapid succession. After recording the initial result, withdraw the probe following the first measurement, and then immediately reinsert the probe into the same spot for the duplicate measurement.

In contrast to field duplicate samples collected for laboratory analysis (see Section 4.10.1), which must be sent in to the laboratory "blind" (i.e., both labeled as regular samples), both replicates for field measurements can be done by the same personnel, and are generally not done as a "blind" test (i.e., the same personnel may perform and observe both measurements).

The results of the field duplicates should be reported on the Stormwater Sample Field Test Report form (CEM-2052). The RPD between each pair of duplicate measurements must then be calculated and compared to the data quality objectives as specified in the CSMP (see Section 4.11.1).

4.10 QA/QC – Laboratory Analyses

The quality of analytical data is dependent on the ways in which samples are collected, handled, and analyzed. Various procedures discussed above, such as clean sampling techniques and documentation (i.e., forms) are essential elements in the overall QA/QC effort. Additional measures pertaining to samples that are submitted for laboratory testing should be included in the CSMP to maximize the data's quality and usefulness, as described in this section. The information presented in this section was adapted from

Section 11 of the Caltrans' *Guidance Manual: Stormwater Monitoring Protocols* (Third Edition) contained within *Caltrans Comprehensive Protocols Guidance Manual* (Caltrans, 2003b).

Improved control of laboratory data quality is achieved by incorporating the following elements within the sample collection effort:

- Duplicate samples
- Blank samples
- MS/MDS samples
- QC sample schedule

Each of these types of samples and the relevant responsibilities of monitoring field personnel are described below, followed by a discussion of recommended minimum frequencies for the various types of QC samples. The results of the field QC samples are then used to evaluate the quality of the reported data (data evaluation is discussed in Section 4.11).

4.10.1 Duplicate Samples

Analytical precision is a measure of the reproducibility of data and is assessed by analyzing two samples that are presumed to be identical. Any significant differences between the samples indicate an unaccounted-for factor or a source of bias. There are typically two types of duplicate samples that require special sampling considerations: field duplicates and laboratory duplicates.

Field Duplicate Samples. Field duplicates are used to assess variability attributable to sample collection procedures. For grab samples, duplicate samples are collected by simultaneously or sequentially (in rapid succession) filling two grab sample bottles at the same location. If intermediate containers are used, first pour an incremental amount into one sample bottle and then pour a similar amount into the second. Continue going back and forth until both bottles are full.

For laboratory analyses, the field duplicate sample should be submitted to the laboratory "blind" (i.e., not identified as QC sample, but labeled as if it were a normal sample, with a different site identification and slightly different sample time than the regular sample).

A field duplicate sample should be analyzed once for every 10 samples collected from a project site, or one duplicate sample per project site annually, whichever is more frequent.

Laboratory Duplicate Samples. Laboratory duplicates (also called laboratory splits) are used to assess the precision of the analytical method and laboratory sample handling. For the laboratory duplicate analysis, the analytical laboratory will split one sample into two portions and analyze each one.

When collecting samples to be analyzed for laboratory duplicates, typically double the normal sample volume is required. This effort requires filling a larger size sample bottle, or filling two normal size sample bottles, labeling one with the site name and the second with the site name plus "laboratory duplicate." Laboratory duplicate samples are collected, handled, and delivered to the analytical laboratory in the same manner as environmental samples (but not as blind samples).

Enough extra sample volume for the laboratory to create a duplicate should be collected once every 10 samples collected from a project site, or one duplicate sample per project site annually, whichever is more frequent.

4.10.2 Blank Samples

Potential sample contamination is assessed using blank samples. Blanks are prepared to identify potential sample contamination occurring during field collection, handling, shipment, storage, and laboratory handling and analysis. Blanks are evaluated during various stages of the sampling and analytical process to determine the level of contamination, if any, introduced at each step. The collection and uses of the types of blank samples associated with typical stormwater monitoring field procedures are described below.

"Blank water" refers to contaminant-free, reagent-grade water provided by the laboratory performing the environmental and blank analyses. Typically, this water is the laboratory's reagent water that is used in the analytical or cleaning processes, as well as for the lab's internal method blanks. The analytical laboratory should provide the blank water used for equipment and field blanks.

Equipment Blanks. Equipment blank samples are typically prepared only when samples are being collected for metals, nitrates, and organic contaminants such as pesticides, herbicides, polycyclic aromatic hydrocarbons (PAHs), organic carbon, and phthalate

compounds, and when sample collection equipment is involved (i.e., when the sample bottles are not filled by direct submersion). Before using sampling equipment for sample collection activities, blanks should be collected to verify that the equipment is not a source of sample contamination. To account for any contamination introduced by sampling equipment or intermediate containers, equipment blanks are prepared by using the equipment to fill a clean container with blank water. The concentrations of the specific parameters of concern are then measured. These blanks may be submitted "blind" to the laboratory by field personnel or prepared internally by the laboratory.

Collection of equipment blanks from intermediate sample containers may not be required if certified pre-cleaned bottles are used as the intermediate sample containers. The manufacturer can provide certification forms that document the concentration to which the bottles are "contaminant-free." These concentrations should be equivalent to or less than the program RLs. If the certification level is above the program RLs, 2 percent of the bottles in a "lot" or "batch" should be blanked at the program detection limits with a minimum frequency of one bottle per batch.

Field Blanks. Field blanks are typically used only when samples are being collected for laboratory analysis for bacteria, trace metals, nitrates, and trace organic contaminants such as pesticides, herbicides, PAHs, organic carbon, and phthalate compounds. Field blanks are necessary to evaluate whether contamination is introduced during field sampling activities.

Field blanks are prepared by the field crew, under normal sample collection conditions, at some time during the collection of normal samples. Field blanks are prepared by transporting a container of laboratory-provided blank water into the field, and processing the water through the same procedures used for sample collection. For samples collected by direct submersion, grab sample field blanks should be prepared by pouring a sample directly from the bottle of blank water into the grab sample containers in the field. When intermediate containers or equipment are used, field blanks should be collected using clean intermediate containers or other clean equipment with laboratory-supplied blank water in the same manner as normal sample collection. The filled blank sample bottles should be sealed, placed on ice, and sent to the laboratory to be analyzed for the required constituents.

As with field duplicate samples, field blank samples should be submitted to the laboratory "blind" (i.e., not identified as a QC sample, but labeled with a different site identification and slightly different sample time than the regular sample). For additional

information, see Caltrans naming guidelines described in the *SWPPP Template* (Caltrans, 2012a).

Field blanks should be collected at a frequency no less than once per year per project site, or once every 10 samples at a given site annually, whichever is more frequent. Additional blanks should be collected when there is a change in field personnel, equipment, or procedures.

Trip Blanks. Trip blanks are typically used only when samples are being collected for laboratory analysis for volatile organic compounds. Trip blanks are used to determine whether sample contamination is introduced during sample transportation and delivery. Trip blanks are prepared at the analytical laboratory, by filling the sample bottle with blank water and securing the bottle lid. Trip blanks are transported unopened to and from the sampling location along with normal sample bottles. Trip blanks are analyzed like normal samples.

Method Blanks. For each batch of samples, method blanks (also called control blanks) are typically run by the laboratory to determine the level of contamination associated with laboratory reagents and glassware. The laboratory prepares method blanks using laboratory reagent-grade blank water. Results of the method blank analysis should be reported with the sample results. At a minimum, the laboratory should report method blanks at a frequency of 5 percent (one method blank with each batch of up to 20 samples).

4.10.3 Laboratory MS and MSD Analyses

MS and MSD analyses are typically used only when samples are being collected for trace metals, nutrients, and trace organics analysis. MS/MSD analyses are used to assess the accuracy (MS) and precision (MSD) of the analytical methods in the sample matrix. The analytical laboratory prepares MS samples by splitting off three aliquots of the environmental sample and adding known amounts of target analytes to two of the three environmental sample aliquots. The results of the analysis of the unspiked environmental sample are compared to the MS analysis results, and “percent recovery” of each spike is calculated to determine the accuracy of the analysis. The results of the two MS analyses are compared to calculate RPD as an additional measure of analytical precision.

When collecting samples to be specified for MS/MSD analysis, typically triple the normal sample volume is required. This effort will require filling a larger size sample bottle, or filling three normal size sample bottles, labeling one with the site name and the

other two with the site name plus "MS/MSD." MS/MSD samples are collected, handled, and delivered to the analytical laboratory in the same manner as environmental samples (but not as blind samples). Analytical laboratories often will perform MS/MSD analyses at no charge on a specified sample when a certain minimum number of samples are submitted for analysis.

Enough extra sample volume for the laboratory to create MS/MSD samples should be collected once every 10 samples collected at a given project site, or once annually per project site, whichever is more frequent.

4.10.4 QC Sample Schedule

Table 4-3 summarizes the minimum frequencies of QC sample collection/preparation for the Caltrans' stormwater monitoring programs based on EPA guidance (EPA, 1995). These frequencies are minimal and may be increased depending on the nature and objectives of the study being undertaken, or if QA/QC problems (e.g., contamination) are discovered.

Table 4-3. Recommended Minimum QC Sample Frequency.

QA/QC Sample Type Minimum	Sampling Frequency	Constituent Class
Duplicate Field Measurements	For each parameter, once every 10 measurements at a given project site, or once annually per project, whichever is more frequent.	Field-measured parameters (pH and Turbidity)
Field Duplicate Samples	Once every 10 samples collected at a given project site, or once annually per project, whichever is more frequent.	All laboratory analyses
Laboratory Duplicate Samples	Once every 10 samples collected at a given project site, or once annually per project, whichever is more frequent.	All laboratory analyses
Equipment Blanks	Sample bottles should be blanked every batch2; or manufacturer or laboratory-certified to concentrations below the reporting limits used for the sampling program. Annually for field equipment used in sample collection, when the equipment is used for direct sample collection.	Metals and organic contaminants.1
Field Blanks	Once every 10 samples collected at a given project site, or once annually per project site, whichever is more frequent.	Metals and organic contaminants.1

Table 4-3. (Continued)

QA/QC Sample Type Minimum	Sampling Frequency	Constituent Class
Trip Blanks	Once every three trips to a given project site, or once annually per project site, whichever is more frequent.	VOCs
Matrix Spike/Matrix Spike Duplicate	Once every 10 samples collected at a given project site, or once annually per project site, whichever is more frequent.	Metals and organic contaminants.[1]

Notes:
[1] Common contaminants include phthalate compounds, pesticides, and organic carbon (total organic carbon and biochemical oxygen demand), nitrate as N, and polycyclic aromatic hydrocarbons. Analyze blanks for these constituents as appropriate for constituents monitored in specific projects.
[2] A batch is defined as the group of bottles that has been cleaned at the same time, in the same manner; or, if decontaminated bottles are sent directly from the manufacturer, the batch would be the lot designated by the manufacturer in their testing of the bottles.

A QC sample schedule should be developed, included in the CSMP, and followed closely by field personnel. The project QC sample schedule should meet the minimum QC sample frequency criteria each year over the term of the project.

4.11 Data Management

4.11.1 Field Data Screening and Validation

When the field data sheets are received following each sampling event, it is important for the WPC manager to check the reported data as soon as possible to identify any errors committed in sampling or reporting, as well as exceedance of NALs, Receiving Water Monitoring Triggers (for Risk Level 3 sites with direct discharge to receiving water), and NELs (for ATS). The initial screening includes the following checks:

- Completeness. The field sheets should be checked to ensure that all field tests and measurements specified in the CSMP were performed, including the requested QA/QC analyses.
- Labeling Errors. On occasion field personnel commit errors on sample labels, field log forms, or chain-of-custody forms. Reported values that appear out of range or inconsistent are indicators of potential field reporting or equipment problems, and should be investigated when detected.
- Irregularities found in the initial screening should immediately be reported to the monitoring field crew for clarification or correction. This process can identify and correct errors that would otherwise cause problems further along in the data evaluation process, or in subsequent uses of the data for higher-level analysis.

Field QA/QC parameters that should be reviewed are classified into the following categories:

Precision (analysis of duplicate field measurements). The RPD between the initial result and the duplicate result is calculated to evaluate differences in duplicate results for pH or turbidity. See Section 4.12.2 for detailed information on calculating RPD. A duplicate measurement RPD of plus/minus 25 percent or greater indicates an unacceptable level of difference between the two measurements.

Field measurement duplicate results exceeding 25 percent RPD may indicate either inconsistent sample collection/measurement, or highly variable discharge quality. The duplicate measurements should be repeated with new samples, with special care taken to collect consistent duplicate samples.

Accuracy (field meter calibration). For pH and turbidity, record the results on form CEM-2052 Stormwater Sample Field Test Report. For specialty meters, record the results of field meter calibration on the Stormwater Meter Calibration Record – Specialty Meters (CEM-2058 for conductivity, dissolved oxygen, or other parameters).

Evaluation of QA/QC results. Each of these field measurement QA/QC parameters should be compared to the data quality objectives established for the study. The key steps in the analysis of each of these field QA/QC parameters are as follows:

1. Compile a complete set of the QA/QC results for the parameter being analyzed.
2. Compare the field QA/QC results to accepted criteria.
3. Compile any out-of-range values and report them to the monitoring crew for verification.
4. Attach appropriate qualifiers to data that do not meet QA/QC acceptance criteria.
5. Prepare a report that tabulates the success rate for each QA/QC parameter analyzed.

4.11.2 Laboratory Data Package Review

Laboratory Data Screening. When the laboratory reports are received following each sampling event, it is important to check the reported data as soon as possible to identify errors committed in sampling, analysis, or reporting. The laboratory must report results in a timely fashion (as defined in the contractor's contract with the laboratory and in

compliance with the Caltrans contract) and the results then must be reviewed immediately upon receipt. This review may allow for re-analysis of questionable (out-of-range) results within the prescribed holding times. The initial screening includes the following checks:

- **Completeness.** The chain-of-custody forms should be checked to ensure that all laboratory analyses specified in the CSMP were requested. The laboratory reports should also be checked to ensure that all laboratory analyses are performed as specified on the chain-of-custody forms, including the requested QA/QC analyses.
- **Holding Times.** The laboratory reports should be checked to verify that all analyses were performed within the prescribed holding times.
- **Reporting Limits.** The reported analytical limits should meet or be lower than the levels agreed upon prior to laboratory submission.
- **Reporting Errors.** On occasion, laboratories commit typographical errors or send incomplete results. Reported concentrations that appear out of range or inconsistent are indicators of potential laboratory reporting problems, and should be investigated when detected. Examples of this would be a reported value that is an order of magnitude different than levels reported for the same constituent for other events.

Irregularities found in the initial screening should immediately be reported to the laboratory for clarification or correction. This process can identify and correct errors that would otherwise cause problems further along in the data evaluation process, or in subsequent uses of the data for higher-level analysis. When appropriate, re-analysis of out-of-range values can increase confidence in the integrity of questionable data.

Laboratory Data Validation. The data quality evaluation process is structured to provide checks to ensure that the reported data accurately represented the concentrations of constituents actually present in water quality samples. Data evaluation can often identify sources of contamination in the sampling and analytical processes, as well as detect deficiencies in the laboratory analyses or errors in data reporting. Data quality evaluation allows monitoring data to be used in the proper context with the appropriate level of confidence.

QA/QC parameters that should be reviewed are classified into the following categories:

1. Contamination check results (method, field, and equipment blanks)

2. Precision analysis results (laboratory, field, and MSDs)

3. Accuracy analysis results (MSs and laboratory control samples)

Each of these QA/QC parameters should be compared to the data quality objectives listed in Table 4-4. The key steps in the analysis of each of these QA/QC parameters are as follows:

1. Compile a complete set of the QA/QC results for the parameter being analyzed.
2. Compare the laboratory QA/QC results to accepted criteria.
3. Compile any out-of-range values and report them to the laboratory for verification.
4. Attach appropriate qualifiers to data that do not meet QA/QC acceptance criteria.
5. Prepare a report that tabulates the success rate for each QA/QC parameter analyzed.

Refer to Section 13 of the Caltrans' Guidance Manual: Stormwater Monitoring Protocols (Third Edition) contained within Caltrans Comprehensive Protocols Guidance Manual (Caltrans, 2003b) for specific direction on evaluating the results of contamination, accuracy, and precision checks, and on qualifying data that do not meet data quality objectives.

Table 4-4. Control Limits for Precision and Accuracy for Water Samples

Constituent	Maximum Allowable RPD	Recovery Lower Limit	Recovery Upper Limit
VOCs-Solvents	20%	Constituent specific	
SVOCs	30%-50%	Constituent specific	
Pesticides/Herbicides	25%	Constituent specific	
TDS	20%	80%	120%
BOD	20%	80%	120%
Total Phosphorus	20%	80%	120%
NH_3-N	20%	80%	120%
NO_3-N	20%	80%	120%
pH	20%	N/A	N/A
Turbidity	20%	N/A	N/A
Alkalinity	20%	80%	120%
Phosphate	20%	80%	120%
Metals	20%	75%	125%
Coliform bacteria	N/A	N/A	N/A

Table 4-4. (Continued)

Notes:
Recovery, lower and upper limits refer to analysis of spiked samples
BOD = biochemical oxygen demand
N/A = not applicable
NH_3-N = ammonia nitrogen
NO_3-N = nitrate nitrogen
RPD = relative percent difference between duplicate analyses
SVOC = semi-volatile organic compounds
TDS = total dissolved solids
VOC = volatile organic compounds

The laboratory data can also be screened using the Caltrans' Stormwater Management Program Laboratory Electronic Data Delivery (EDD) Error Checker. The laboratory will need to be trained to use the tool and must report the data in the Caltrans' standard electronic format for stormwater monitoring data. The project's data manager will need to be trained to use the EDD Error Checker.

4.12 Data Evaluation

4.12.1 Calculating Daily Average

The daily average is calculated by dividing the sum of the set of daily results by the number of results in the set. For example, on a single day, assume three samples were collected from a project site representative discharge point with turbidity results of 260, 680, and 550 NTUs. The turbidity daily average would be calculated by summing the turbidity results and dividing the sum by three ([260+680+550]/3), resulting in a daily average turbidity of 497 NTU, which exceeds the NAL but not the Receiving Water Monitoring Trigger.

However, pH is defined as the negative log (base ten) of the hydrogen (or hydronium) ion concentration, represented by the following equation: $pH = -\log_{10}[H^+]$. Calculating the pH daily average requires the following steps:

- Take the negative of each pH value
- Take the antilog (inverse) of each negative pH value
- Sum the set of antilog pH values
- Divide the sum by the number of pH values to obtain an average
- Calculate the negative log of that average value

For example, on a single day, assume three samples were collected from a discharge point with pH results of 7.5, 6.5, and 9. The pH daily average would be calculated by

taking the antilogs of -7.5, -6.5, and -9, which are 31.6 x 10^{-9}, 316 x 10^{-9}, 1.00 x 10^{-9}, summing the antilog values, which is 349 x 10^{-9}, dividing that sum by 3, which is 116 x 10^{-9}, and taking the log of that sum and converting to its negative value, which is 6.93. The calculated daily pH value does not exceed the NAL or Receiving Water Monitoring Trigger.

If any of the results are reported as non-detect, a value of one-half the RL should be used in the calculation of the daily mean. This approach cannot be used with pH measurements.

The SWRCB provides additional information in its technical bulletin located at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/bulletin_2013_1.pdf.

4.12.2 Calculating Relative Percent Difference

The RPD is calculated using the following formula:

$$\text{RPD} = \frac{(\text{Sample result A} - \text{Sample result B})}{([\text{Sample result A} + \text{Sample result B}]/2)} * 100$$

For example, a sample and a duplicate sample were collected for a project site with total dissolved solids results of 260 and 300, respectively. The RPD would be calculated by taking the difference between the results, dividing the difference by the calculated mean of the results, and multiplying by 100 ((260-300)/([260+300]/2)* 100), resulting in a percent difference of 14.3 percent. This would be an acceptable RPD.

Note that pH is defined as the negative log (base ten) of the hydrogen (or hydronium) ion concentration, represented by the following equation: $pH = -\log_{10}[H^+]$. Calculating the percent difference for pH results, therefore, requires taking the antilog (inverse of each negative pH value) prior to calculating the RPD. On the log scale, a difference of 25 percent corresponds to a difference of just over 0.1 pH unit. Therefore, duplicate pH measurements may be simply compared directly; a difference greater than 0.1 pH units is considered an unacceptable level of difference.

RPD should not be calculated from any results reported as non-detect.

4.12.3 Monitoring and Reporting Run-on

Run-on from surrounding areas must be monitored and reported in the Stormwater Site Inspection Report form (CEM-2030) if there is reason to believe run-on may contribute to an exceedance of NALs or Receiving Water Monitoring Triggers. To determine if the source of an observed exceedance is run-on to the construction site, the levels of pH, turbidity, and suspended sediment concentrations (SSC) (if appropriate) from run-on samples should be evaluated. High levels will indicate that the sources outside of the construction site may be contributing to the measured pH level or sediment load. Identification of adjacent landowner discharges and implementation of other BMP measures should be the first steps taken to remove pollutants from run-on or eliminate unauthorized discharges from run-on.

Inspect the site perimeter for evidence of run-on flowing on to the site from outside areas. Existing drainage channels (large and small) and their flow paths through the construction site should be noted. Non-stormwater run-on could be caused by a forest fire or any other natural disaster or could be from authorized or unauthorized discharges from an adjacent property.

4.12.4 Assessing the Need for Corrective Measures

If an NAL exceedance occurs, the project site should be evaluated in an effort to determine the cause or source of the exceedance. Runoff patterns should be examined to determine whether the exceedance is due to run-on or a failed, missing, or poorly maintained BMP. Information gathered from the site inspection will be used to identify the source(s). Storm Water Quality Task Force (SWQTF) (2001) developed the following list of conditions or areas on a construction site that may cause sediment, silt, and/or turbidity in runoff:

- Exposed soil areas with inadequate erosion control measures
- Active grading areas
- Poorly stabilized slopes
- Lack of perimeter sediment controls
- Areas of concentrated flow on unprotected soils
- Poorly maintained erosion and sediment control BMP
- Unprotected soil stockpiles

- Failure of an erosion or sediment control BMP

Document on the Stormwater Site Inspection Report form (CEM-2030) any instances where the discharge flow path crosses one or more of the conditions or areas listed above. If any one of these conditions and areas is found during the inspections, their presence should be documented, preferably with GPS coordinates and photographs.

5 NON-VISIBLE POLLUTANTS MONITORING

5.1 Permit Requirements

Non-visible pollutant sampling and testing must be conducted if a breach, malfunction, leakage, or spill is observed that could result in non-visible pollutant(s) being discharged into surface waters during a rain event. Non-visible pollutant monitoring is only required when a rain event producing a discharge occurs during project working hours.

5.2 What and When to Monitor

Samples for non-visible pollutant(s) monitoring must be collected when all four conditions listed below exist:

1. At least one pollutant is identified in the pollutant source assessment conducted as part of the SWPPP.
2. A breach, malfunction, leakage, or spill is observed during last visual inspection.
3. As a result of observation in item 2 above, the pollutant(s) could be discharged into surface waters.
4. A rain event (not restricted to only a "qualifying rain event") produces runoff during project working hours.

When all four conditions are met, samples must be collected and analyzed as follows:

1. Collect one grab sample of the discharge from all locations that meet the criteria above and that can be safely accessed, during the first two hours of discharge occurring during project working hours. Discharges from a project site can occur anytime during a rain event, but may not occur for some time after the start of the rain. Therefore, the site will need to be monitored throughout the day when rain is falling.
2. Collect one grab sample of stormwater that has not come in contact with the disturbed soil or the materials stored or used on site (uncontaminated sample) during the first two hours of discharge.
3. Collect the appropriate number and type of QA/QC samples (see Section 4.10).
4. Analyze the discharge samples and uncontaminated samples for all non-visible pollutant parameters that were identified in the pollutant source assessment conducted as part of the SWPPP, and that could be discharged into surface waters.

Conditions Triggering Sampling. The SWPPP pollutant source assessment may identify areas within the project site that require monitoring to be performed, if the area is exposed to stormwater that produces a discharge during project working hours, and pollutant(s) could be discharged into surface waters. Construction activities or BMP failures that may trigger sampling include:

- The use and application of certain products, if application occurred during a rain event or within 24 hours preceding a rain event, and the products are exposed to stormwater that produces a discharge during project working hours. Examples include: methyl methacrylate concrete sealant applied to bridge decks; solvents that have been used to clean equipment; fertilizers, herbicides, or pesticides applied for landscaping; or soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to stormwater runoff.
- Materials or wastes containing potential non visible pollutants not stored under watertight conditions. Examples include the storage of lead-contaminated soils without plastic covers, or pressure-treated wood in stockpiles without plastic covers.
- Materials or wastes containing potential non-visible pollutants stored under watertight conditions, but (a) a breach, leakage, malfunction, or spill is observed; and (b) the leak or spill has not been cleaned up prior to the rain event producing discharge; and (c) there is the potential for discharge of non-visible pollutants to surface waters or drainage system during the rain event.

Sampling and analysis is not required under the following conditions (SWQTF, now known as the California Stormwater Quality Association [CASQA], 2001):

- Where a construction project is self-contained and does not allow any contaminated runoff to exit the site.
- Where construction materials and compounds are kept or used so that they never come in contact with stormwater (in water-tight containers, under a water-tight roof, inside a building, etc.).
- Where, for specific materials, the BMPs implemented at the construction site fully contain the exposed pollutants (e.g., bermed concrete washout area).
- For building or landscape materials that are in their final constructed form or are designed for exposure (fence materials, guardrails, painted structures, support

structures and equipment that will remain exposed at the completion of the project, etc.).

- Where pollutants may have been spilled or released on site, but have been properly cleaned up and stormwater exposure has been eliminated prior to a rain event.
- When the rain event discharge occurs outside of project working hours or does not produce a discharge.
- For a project site where no potential pollutants were identified.
- For a project site where the last visual inspection does not identify any breach, malfunction, leakage, or spill.

Sample Collection and Analysis. Samples must be analyzed for the non-visible pollutant parameters identified in the pollutant source assessment to identify the level of contamination and the potential impacts to receiving waters. Construction material inventories and the project SWPPP provide information on materials currently in use or proposed for use on the construction site. Table 5-1 lists common materials used at construction sites that can contaminate runoff with non-visible pollutants, their potential pollutants, and water quality indicators. This list is not meant to be inclusive but to provide information to the QSD and WPC manager.

For some construction materials, the pollutant parameter will be the compound itself. For example, if the pesticide malathion is used on the site, samples of runoff will be analyzed specifically for the malathion concentration. For sites contaminated by historic practices, the runoff samples are typically analyzed for specific compounds known to be historical contaminants. For other materials, an associated indicator will be measured. In the case of general masonry products, their potential impact on water quality involves alteration of the pH level. Some potential pollutants are visually observable and do not require testing (i.e., petroleum products including gasoline, diesel, and lubricants; colored paints; sand, gravel, or topsoil; asphalt cold mix; Portland cement; antifreeze).

Table 4-1 includes sample collection and analysis methods for typical non-visible pollutants. Some of the indicators potentially can be analyzed in the field (i.e., pH, residual chlorine, total dissolved solids); others require analysis in laboratories. It is important that the method of measurement be consistent during each sampling event and throughout the program to maximize the comparability of the various samples. Samples analyzed by different methods cannot be easily compared.

Table 5-1. Pollutant Testing Guidance Table[1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Asphalt Products	Hot Asphalt	Yes – Rainbow Surface or Brown Suspension	Visually Observable – No Testing Required		
	Asphalt Emulsion				
	Liquid Asphalt (tack coat)				
	Cold Mix				
	Crumb Rubber	Yes – Black, solid material	Visually Observable – No Testing Required		
	Asphalt Concrete (Any Type)	Yes – Rainbow Surface or Brown Suspension	Visually Observable – No Testing Required		
Cleaning Products	Acids	No	**pH** Acidity Anions (acetic acid, phosphoric acid, sulfuric acid, nitric acid, hydrogen chloride)	pH Meter	EPA 150.2 (pH)
					SM 2310B (Acidity)
					EPA 300.0 (Anion)
	Bleaches	No	**Residual Chlorine**	Chlorine test kit	SM 4500-CL G (Res. Chlorine)
	Detergents	Yes – Foam	Visually Observable - No Testing Required		
	TSP	No	**Phosphate**	None	EPA 365.3 (Phosphate)
	Solvents	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Portland Concrete Cement & Masonry Products	Portland Cement (PCC)	Yes – Milky Liquid	Visually Observable – No Testing Required		
	Masonry products	No	**pH**	pH Meter	EPA 150.2 (pH)
			Alkalinity		SM 2320 (Alkalinity)
	Sealant (Methyl Methacrylate)	No	**Methyl Methacrylate**	None	EPA 625 (SVOC)
			Cobalt		EPA 200.8 (Metal)
			Zinc		
	Incinerator Bottom Ash Bottom Ash Steel Slag Foundry Sand Fly Ash Municipal Solid Waste	No	**Aluminum** **Calcium** **Vanadium** **Zinc**	None	EPA 200.8 (Metal) EPA 200.7 (Calcium)
	Mortar	Yes – Milky Liquid	Visually Observable – No Testing Required		
	Concrete Rinse Water	Yes – Milky Liquid	Visually Observable – No Testing Required		
	Non-Pigmented Curing Compounds	No	Acidity	pH Meter	SM 2310B (Acidity)
			Alkalinity		SM 2320 (Alkalinity)
			pH		EPA 150.2 (pH)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Landscaping and Other Products	Aluminum Sulfate	No	Aluminum	TDS Meter	EPA 200.8 (Metal)
			TDS		SM2540 C (TDS)
			Sulfate		EPA 300.0 (Sulfate)
	Sulfur-Elemental	No	**Sulfate**	None	EPA 300.0 (Sulfate)
	Fertilizers-Inorganic[4]	No	**Nitrate**	None	EPA 300.0 (Nitrate)
			Phosphate	None	EPA 365.3 (Phosphate)
			Organic Nitrogen	None	SM4500-NH3 C (TKN)
			Potassium	None	EPA 200.8 (Metal)
	Fertilizers – Organic	No	TOC	None	SM 5310 C (TOC)
			Nitrate		EPA 300.0 (Nitrate)
			Organic Nitrogen		SM4500-NH3 C (TKN)
			COD		EPA 410.4 (COD)
	Natural Earth (Sand, Gravel, and Topsoil)	Yes – Cloudiness and turbidity	Visually Observable – No Testing Required		
	Herbicide	No	**Herbicide**	None	Check lab for specific herbicide or pesticide
	Pesticide		**Pesticide**		
	Lime		Alkalinity	pH Meter	SM 2320 (Alkalinity)
			pH		EPA 150.2 (pH)

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Painting Products	Paint	Yes	Visually Observable - No Testing Required		
	Paint Strippers	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
	Resins	No	**COD**	None	EPA 410.4 (COD)
			SVOC		EPA 625 (SVOC)
	Sealants	No	**COD**	None	EPA 410.4 (COD)
	Solvents	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Lacquers, Varnish, Enamels, and Turpentine	No	**COD**	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Thinners	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			COD		EPA 410.4 (COD)
Portable Toilet Waste Products	Portable Toilet Waste	Yes	Visually Observable – No Testing Required		

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Contaminated Soil [5]	Aerially Deposited Lead[3]	No	**Lead**	None	EPA 200.8 (Metal)
	Petroleum	Yes – Rainbow Surface Sheen and Odor	Visually Observable – No Testing Required		
	Mining or Industrial Waste, etc.	No	**Contaminant Specific**	Contaminant Specific – Check with laboratory	Contaminant Specific – Check with laboratory
Line Flushing Products	Chlorinated Water	No	**Total chlorine**	Chlorine test kit	SM 4500-CL G (Res. Chlorine)
Adhesives	Adhesives	No	COD	None	EPA 410.4 (COD)
			Phenols	None	EPA 420.1 (Phenol)
			SVOC	None	EPA 625 (SVOC)
Dust Palliative Products	Salts (Magnesium Chloride, Calcium Chloride, and Natural Brines)	No	Chloride	None	EPA 300.0 (Chloride)
			TDS	TDS Meter	SM 2540 C (TDS)
			Cations (Sodium, Magnesium, Calcium)	None	EPA 200.7 (Cations)
Vehicle	Antifreeze and Other Vehicle Fluids	Yes – Colored Liquid	Visually Observable – No Testing Required		
	Batteries	No	Sulfuric Acid	None	EPA 300.0 (Sulfate)
			Lead	None	EPA 200.8 (Metal)
			pH	pH Meter	EPA 150.2 (pH)
	Fuels, Oils, Lubricants	Yes – Rainbow Surface Sheen and Odor	Visually Observable – No Testing Required		

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Soil Amendment/ Stabilization Products	Polymer/Copolymer[6, 7]	No	**Organic Nitrogen**	None	EPA 351.3 (TKN)
			BOD	None	SM 5210 B (BOD)
			COD	None	EPA 410.4 (COD)
			DOC	None	SM 5310 C (DOC)
			Nitrate	None	EPA 300.0 (Nitrate)
			Sulfate	None	EPA 300.0 (Sulfate)
			Nickel	None	EPA 200.8 (Metal)
	Straw/Mulch	Yes – Solids	Visually Observable – No Testing Required		
	Lignin Sulfonate	No	Alkalinity	None	SM 2320 (Alkalinity)
			TDS	TDS Meter	SM 2540 C(TDS)
	Psyllium	No	COD	None	EPA 410.4 (COD)
			TOC		SM 5310 C (TOC)
	Guar/Plant Gums	No	COD	None	EPA 410.4 (COD)
			TOC		SM 5310 C (TOC)
			Nickel		EPA 200.8 (Metal)
	Gypsum	No	pH	pH Meter	EPA 150.2 (pH)
			Calcium	None	EPA 200.7 (Calcium)
			Sulfate	None	EPA 300.0 (Sulfate)
			Aluminum	None	EPA 200.8 (Metal)
			Barium		
			Manganese		
			Vanadium		

Table 5-1. Continued

Category	Construction Site Material	Visually Observable?	Pollutant Indicators[2]	Suggested Analyses Field[3]	Laboratory
Treated Wood Products	Ammoniacal-Copper-Zinc-Arsenate Copper-Chromium-Arsenic Ammoniacal-Copper-Arsenate Copper Naphthenate	No	Arsenic Total Chromium **Copper** Zinc	None	EPA 200.8 (Metal)
	Creosote	Yes – Rainbow Surface or Brown Suspension	Visually Observable – No Testing Required		

Adapted from Attachment S of the *Storm Water Pollution Prevention Plan/Water Pollution Control Program Preparation Manual* (Caltrans, 2007)

Notes:

1. If specific pollutant is known, analyze only for that specific pollutant. See Material Data Safety Sheet to verify.
2. For each construction material, test for one of the pollutant indicators. **Bolded** pollutant indicates lowest analysis cost or best indicator. However, the composition of the specific construction material, if known, is the first criterion for selecting which analysis to use.
3. See www.hach.com, www.lamotte.com, www.ysi.com and www.chemetrics.com for some of the test kits.
4. If the type of inorganic fertilizer is unknown, analyze for all pollutant indicators listed.
5. Only if special handling requirements are required in the Standard Special Provisions for aerially deposited lead
6. If used with a dye or fiber matrix, it is considered visually observable and no testing is required.
7. Based upon research conducted by Caltrans, the following copolymers/polymers do not discharge pollutants and water quality sampling and analysis is not required: Super Tak, M-Binder, Fish Stik, Pro40dc, Fisch-Bond, Soil Master WR, and EarthGuard.

Acronyms:

BOD = biochemical oxygen demand
COD = chemical oxygen demand
DOC = dissolved organic carbon
EPA = United States Environmental Protection Agency
TKN = total kjeldahl nitrogen
TOC = total organic carbon
TSP = tri-sodium phosphate
VOC = volatile organic compounds
HACH = Global company that provides advanced analytical systems and technical support for water quality testing.
SM = Standard Method
SVOC = semi-volatile organic compounds
TDS = total dissolved solids

References:

California Storm Water Quality Task Force, 2001 (now known as the California Stormwater Quality Association). *Construction Storm Water Sampling and Analysis Guidance Document*. October.
National Cooperative Highway Research Program, 2001. *Environmental Impact of Construction and Repair Materials on Surface and Ground Waters, Report 448*.
California Department of Transportation (Caltrans), Environmental Program, 1999. *Soil Stabilization for Temporary Slopes*. October 1.
Caltrans, Division of Environmental Analysis, 2002. *Statewide Storm Water Management Plan*. April.
Caltrans, Environmental Program, 2000. *Statewide Storm Water Quality Practice Guidelines*. August.
Caltrans, 2000a. *Soil Stabilization for Temporary Slopes and District 7 Erosion Control Pilot Study*. June.
Caltrans, 2000b. *Stormwater Monitoring Protocols, Guidance Manual*. May.

5.3 Where to Monitor

One grab sample must be collected at all discharge locations identified as potentially discharging non-visible pollutants, per the criteria stated above. See Section 4.2 for monitoring location selection guidelines. For non-visible pollutants, samples should be collected only from sites that be safely accessed during the first two hours of discharge occurring during project working hours.

One grab sample of uncontaminated stormwater that has not come in contact with the disturbed or contaminated soil or with the exposed materials stored or used on site also must be collected during the first two hours of discharge. The uncontaminated sample could be collected upgradient from the non-visible pollutant source/spill or from discharge locations whose drainage areas do not come into contact with the non-visible pollutant source/spill. Historical (pre-construction) contamination or exposed materials, such as soil amendments, may be widely spread throughout the site. An uncontaminated sampling location may not exist on the site itself and may have to be located at the perimeter of the site.

Discharge location(s) are sites where the construction site's stormwater runoff flows off site, whether to a municipal separate storm sewer system or receiving water body. Discharge locations could include catch basin inlets, sheet flow, culverts, or outfalls. A site's discharge locations are identified in the SWPPP.

5.4 How to Monitor

Manual grab sampling techniques will be used to collect samples. See Section 4.6.4 for detailed information on grab sample collection and analysis.

5.5 Data Evaluation, Follow-up, and Reporting

5.5.1 Data Evaluation

Once the field and laboratory test results of the non-visible pollutant monitoring are available, compare the results of the uncontaminated sample to the results of the discharge sample. To identify substantial changes of non-visible pollutants in the runoff, the RPD between the uncontaminated sample result and the discharge sample result is calculated for the constituents of concern. See Section 4.12.2 for detailed information on calculating RPD.

Caltrans has determined that a difference (calculated as RPD) between the uncontaminated and discharge sample concentrations greater than plus/minus 30 percent indicates an impact from a non-visible pollutant. Thirty percent has been selected to represent a substantial change in water quality. If the result for the uncontaminated sample is not detected and the result for the contaminated sample is detected, then there is an impact from a non-visible pollutant.

Document whether the contaminated sample test results are lower or higher than the uncontaminated test results.

5.5.2 Assessing the Need for Corrective Measures

Corrective measures are required for any breach, malfunction, leakage, or spill observed during a visual inspection. Corrective measures are also required if a substantial change in water quality was measured (per above, RPD greater than 25 percent).

5.5.3 Implementing Corrective Measures

If any breach, malfunction, leakage, or spill is observed during a visual inspection, corrective measures must be taken to repair any break, malfunction, or leakage, and to remove or prevent pollutants from contacting stormwater discharges.

If the construction site is found to be contributing non-visible pollutants to the runoff, the following steps should be taken as soon as possible:

1. Identify the source.
2. Repair or replace any BMP that has failed or clean up any spilled non-visible pollutants.
3. If there are elevated levels in run-on, notify the RE.
4. Maintain any BMP that is not functioning properly due to lack of maintenance.
5. Evaluate whether additional, alternative, or redesigned BMPs should be implemented.

If sampling and analysis results do not show a substantial change in water quality, non-visible sampling can be stopped. If sampling and analysis results show a substantial change in water quality, then repeat the steps above until the analytical results of upstream and downstream samples are relatively comparable.

Examples of corrective actions include:

- Removing the pollutant source by removing impacted soil, cleaning pavement, applying absorbent materials, then removing and disposing of absorbed materials.
- Covering the pollutant source with methods such as tarps or closing lids.
- Containing the pollutant source by implementing double containment, such as surrounding the source with an impermeable berm.

5.5.4 Reporting

For non-visible pollutants, complete the following forms and submit to the RE as detailed in Section 11:

Prior to storm event:

- CEM-2045 Rain Event Action Plan (if required)

During sampling:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form
  - CEM-2061 Notice of Discharge Report form

Document whether the contaminated sample test results are substantially greater than the uncontaminated test results. See Section 11 for additional information on data reporting and recordkeeping requirements.

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6 NON-STORMWATER DISCHARGE MONITORING

6.1 Permit Requirements

If non-stormwater runoff is discharged off site, Risk Level 2 and 3 projects must conduct non-stormwater effluent sampling and testing to comply with the CGP. Discharge (effluent) samples must be collected at all non-stormwater discharge locations that can be safely accessed. The samples must be tested for pH and turbidity, as well as any other pollutants considered likely to be present in the discharge. Caltrans requires effluent samples be collected from groundwater dewatering discharges for Risk Level 1 projects, and analyzed for pH and turbidity. Some types of non-stormwater discharges that are authorized by a RWQCB permit must also be sampled for additional parameters for which monitoring is required by a RWQCB.

6.2 What and When to Monitor

Effluent must be monitored from all discharge locations where non-stormwater runoff is discharged off site. Effluent samples must be collected and tested from both authorized and unauthorized non-stormwater discharges using the same protocols as those required for stormwater discharge monitoring (see Section 7.2). The appropriate number and type of QA/QC samples must also be collected (see Section 4.10).

During dewatering activities, monitoring must be performed daily when discharging. A minimum of three dewatering discharge samples per day must be collected and analyzed for pH and turbidity.

In addition, run-on from surrounding areas must be monitored and reported in the Stormwater Site Inspection Report form (CEM-2030) if there is reason to believe run-on may contribute to an exceedance of NALs.

The quarterly non-stormwater inspections include specific requirements for identification and assessment of non-stormwater discharges (see Section 3.2.2). Non-stormwater effluent samples must be collected when the discharges are identified. The WPC manager should prepare to collect potential non-stormwater samples prior to conducting quarterly non-stormwater inspections. Sample collection should be conducted during daylight hours. Sample collection should not be performed during dangerous weather conditions.

Authorized Non-Stormwater Discharges: The CGP authorizes certain non-stormwater discharges that may be necessary for the completion of construction projects. Authorized non-stormwater discharges may include those from dechlorinated potable water sources such as: fire hydrant flushing; irrigation of vegetative erosion control measures; pipe flushing and testing; water to control dust; uncontaminated groundwater from dewatering; and other discharges not subject to a separate NPDES permit adopted by a RWQCB. The CGP requires that authorized non-stormwater discharges must:

- Be infeasible to eliminate.
- Comply with BMPs as described in the SWPPP.
- Meet the NALs for pH and turbidity.
- Not cause or contribute to a violation of water quality standards.

The nine RWQCBs throughout the state have different requirements for dewatering. Some RWQCBs may require a separate NPDES permit or specific monitoring and reporting requirements for authorized discharges. Because of these requirements, dewatering discharges cannot be considered as an automatic authorized non-stormwater discharge through the CGP, but rather it may be authorized once the proposed discharge is reported, reviewed, and approved on a case-by-case basis by the appropriate RWQCB. Authorized non-stormwater dewatering discharges may require a permit because some RWQCBs have adopted General Permits for dewatering discharges. Check with the RE or the applicable RWQCB for requirements in the project area. All dewatering discharges from sedimentation basins must be filtered or treated, using appropriate technology. The appropriate technology must be selected based upon potential pollutants and SSCs and concentration.

Unauthorized Non-Stormwater Discharges: Examples of unauthorized non-stormwater discharges common to construction activities include:

- Vehicle and equipment wash water, including concrete washout water.
- Slurries from concrete cutting and coring operations, or grinding operations.
- Slurries from concrete or mortar mixing operations.
- Residue from high-pressure washing of structures or surfaces.
- Wash water from cleaning painting equipment.
- Runoff from dust control applications of water or dust palliatives.

- Sanitary and septic wastes.
- Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.

Non-stormwater samples must be tested for pH and turbidity, and any other likely pollutant in the discharge as identified by the WPC manager. Likely non-stormwater discharge pollutants should be determined by evaluating the non-stormwater discharge source and the non-stormwater flow path to the discharge location. Table 6-1 shows potential authorized non-stormwater sources, potential pollutants, and water quality indicator constituents. Table 6-2 shows unauthorized non-stormwater sources common to construction sites, their potential pollutants, and water quality indicators. With the exception of field analyses, including the measurements performed in the field for turbidity and pH, all analyses must be performed by a laboratory certified for such analyses by the DHS.

6.3 Where to Monitor

Samples must be collected from all discharge locations that can be safely accessed where non-stormwater runoff is discharged offsite. Discharge location(s) are the sites where the construction site runoff flows offsite, whether to a municipal separate storm sewer system or receiving water body. Discharge locations could include catch basin inlets, sheet flow, culverts, or outfalls. Project discharge locations are identified in the project-specific SWPPP. See Section 4.2 for monitoring location selection guidelines.

6.4 How to Monitor

Manual grab sampling techniques will be used to collect samples. See Section 4.6.4 for detailed information on grab sample collection and analysis. Table 4-1 specifies sample collection and analysis methods for typical non-stormwater pollutants. See Table 4-2 for details on field testing for pH and turbidity.

Table 6-1. Common Construction Site Potentially Authorized Non-Stormwater Sources, Potential Pollutants, and Water Quality Indicator Constituents.

Potentially Authorized Stormwater Source	Potential Pollutants	Water Quality Indicator Constituent
Water line and fire hydrant testing	Chlorinated water Suspended solids	Residual chlorine Turbidity
Irrigation	Chlorinated water Suspended solids Fertilizers Soil Amendments and Stabilization Products □ Gypsum □ Polymer/Copolymer □ Lignin Sulfonate □ Psyllium □ Guar/Plant Gums	Residual chlorine Turbidity PO_4, TKN, **NO_3**, TOC, COD □ pH, Ca, **SO_4**, Al, Br, Mn, V □ **TKN**, NO3, BOD, COD, DOC, SO4, Ni □ Alkalinity, **TDS** □ COD, **TOC** □ COD, **TOC**, Ni
Landscape irrigation	Chlorinated water Suspended solids Landscaping amendments □ Pesticides/ Herbicides □ Fertilizers □ Lime □ Aluminum sulfate, sulfur□ Other	Residual chlorine Turbidity □ Contaminant specific □ PO_4, TKN, **NO_3**, TOC, COD □ **pH**, alkalinity □ Al, **TDS**, SO_4
Uncontaminated groundwater dewatering	Suspended solids	Turbidity
Flows from riparian habitats or wetlands, diverted stream flows, springs, rising groundwaters, and uncontaminated groundwater infiltration.	Suspended solids Naturally occurring acids	Turbidity pH

Notes:
Bolded water quality indicator indicates lowest analysis cost or best indicator. However, the composition of the specific chemical, if known, is the first criterion for selecting which analysis to use.

Al = aluminum
BOD = biochemical oxygen demand
Br = bromine
Ca = calcium
COD = chemical oxygen demand
DOC = dissolved organic carbon
Mn = manganese
Ni = nickel
NO_3 = nitrate
PO_4 = phosphate
SO_4 = sulfate
TDS = total dissolved solids
TKN = total Kjeldahl
TOC = total organic carbon
V = vanadium

Table 6-2. Common Construction Site Unauthorized Non-Stormwater Sources, Potential Pollutants, and Water Quality Indicator Constituents.

Unauthorized Non-Stormwater Source	Potential Pollutants	Water Quality Indicator Constituent
Vehicle and equipment wash water	Hydrocarbons and other organic compounds	**TOC**, VOCs, SVOCs
	Oils and greases	TOC
	Nutrients	Nitrate
	Trisodium phosphate or other phosphate-containing detergents	Phosphate
	Metals	Al, Cu, Fe, Pb, Ni, Zn
	Suspended solids	Turbidity
Batteries	Metals, acids	Pb, **pH**
Concrete washout water	Suspended solids	Turbidity
	Concrete	pH
Slurries from concrete cutting and coring operations, Portland cement concrete grinding or asphalt concrete grinding operations	Suspended solids	Turbidity
	Concrete	pH
	Hydrocarbons (gasoline, oil, grease, lubricants)	TOC, SVOCs
Slurries from concrete or mortar mixing operations	Masonry products	**pH**, alkalinity
	Sealant (MMA)	**Methyl Methacrylate**
	Ash, slag, sand, waste	**Al, Ca, V, Zn**
	Curing compounds	**pH**, VOC, SVOC
Blast residue from high-pressure washing of structures or surfaces	Suspended solids	Turbidity
	Masonry products	**pH**, alkalinity
	Metals	Al, Cu, Fe, Pb, Ni, Zn
		TOC, SVOCs
Wash water from cleaning painting equipment	Resins	**COD**, SVOCs
	Thinners	VOCs, **COD**
	Paint Strippers	**VOCs**, SVOCs
	Solvents	**COD**, VOCs, SVOCs
	Lacquers, varnish, enamels, turpentine	**COD**, VOCs, SVOCs
	Sealants	**COD**
Runoff from dust control applications of water or dust palliatives	Salts	Chloride, **TDS**, cations (Ca, Mg, Na, K)
Sanitary and septic wastes	Bacteria, disinfectants	Total/fecal coliform, disinfectant (chemical specific)
Chemical leaks and/or spills of any kind including but not limited to petroleum, paints, cure compounds, etc.	Chemical specific	Chemical specific

Table 6-2. Continued

Notes:

Bolded water quality indicator indicates lowest analysis cost or best indicator. However, the composition of the specific chemical, if known, is the first criterion for selecting which analysis to use.

Al = aluminum
Ca = calcium
Cu = copper
COD = chemical oxygen demand
Fe = iron
K = potassium
Mg = magnesium
MMA = methyl methacryl
Na = sodium
Ni = nickel
Pb = lead
SVOC = semi-volatile organic compound
TDS = total dissolved solids
TOC = total organic carbon
V = vanadium
VOC = volatile organic compound
Zn = zinc

6.5 Data Evaluation, Follow-up, and Reporting

6.5.1 Data Evaluation

Once pH and turbidity sampling and analysis are completed, the daily average (arithmetic mean) of sample results from each sampled discharge point are compared to NALs (see Table 4-2). See Section 4.12.1 for information on calculating daily averages. For dewatering discharges, Caltrans requires that the turbidity of any sample not exceed 200 NTU. The pH value of any sample must be within the range of 6.7 to 8.3 pH units.

Results for monitoring of other constituents are also compared to other standards as required by RWQCB, such as total maximum daily load (TMDL) waste load allocations (if specifically required by RWQCB). In the event a parameter exceeds TMDL Waste Load Allocation or other standard designated by RWQCB, follow RWQCB-required reporting instructions.

For dewatering discharges, Caltrans requires the turbidity of any sample must not exceed 200 NTU. The pH value of any sample must be within the range of 6.7 to 8.3 pH units. Corrective measures must be implemented if sample results exceed either of these values (see Section 6.5.4 for additional information on implementing corrective measures).

6.5.2 Monitoring and Reporting Run-on

Run-on from surrounding areas must be monitored and reported if there is reason to believe run-on may contribute to an exceedance of NALs or elevated non-visible pollutant levels in discharges. See Section 4.12.3 for additional information.

6.5.3 Assessing the Need for Corrective Measures

Sample results are compared to NALs as designated in Table 4-2. Corrective measures are required for unauthorized non-stormwater discharges and for NAL exceedances of either authorized or unauthorized non-stormwater discharges.

6.5.4 Implementing Corrective Measures

If an NAL exceedance occurs, the project site should be evaluated in an effort to determine the cause or source of the exceedance. See Section 4.12.4 for additional information.

If an unauthorized non-stormwater discharge occurs, corrective measures must be taken to eliminate the unauthorized non-stormwater discharge and to reduce or prevent pollutants from contacting non-stormwater discharges. Corrective actions to prevent pollutants from contacting non-stormwater discharges may include:

- Removing the pollutant source by removing impacted soil, cleaning pavement, applying absorbent materials, then removing and disposing of absorbed materials.
- Covering the pollutant source with methods such as tarps.
- Containing the pollutant source by implementing double containment, such as surrounding the source with an impermeable berm.

If the source of the exceedance is run-on to the construction site, the levels of pH, turbidity, and SSC (if turbidity Receiving Water Monitoring Trigger is exceeded) from run-on samples should be evaluated. High levels in run-on samples will indicate that sources outside of the construction site may be contributing to the measured pH level or sediment load. Identification of adjacent landowner discharges and implementation of other BMP measures should be the first steps taken to remove pollutants from run-on or eliminate unauthorized discharges from run-on.

6.5.5 Reporting

For non-stormwater discharge monitoring, complete the following forms and submit to the RE as detailed in Section 11:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form
- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters (if required)

- CEM-2061 Notice of Discharge Report form (if required)
- CEM-2062 NAL Exceedance Report form (if required)

The RE must be notified of sample testing results and discharges per the Caltrans specifications. See Section 11 for detailed information on reporting and recordkeeping requirements.

7 STORMWATER DISCHARGE (PH AND TURBIDITY) MONITORING

7.1 Permit Requirements

For all Risk Level 2 and 3 projects, stormwater discharge (effluent) monitoring must be performed to characterize discharges associated with construction activity from the entire project disturbed area during qualifying rain events. Effluent samples must be collected from representative discharge points (defined below in Section 7.3) where stormwater is discharged offsite and from accumulated stormwater discharges (e.g., stormwater held in a holding pond); these samples must be tested onsite for pH and turbidity. Caltrans requires effluent samples be collected from accumulated stormwater discharges for Risk Level 1 projects and analyzed for pH and turbidity. For Risk Level 2 and Risk Level 3 projects, Caltrans requires receiving water monitoring where stormwater discharges cannot be sampled before a direct discharge to receiving water.

7.2 What and When to Monitor

A minimum of three effluent samples must be collected daily from each representative discharge point (defined in Section 7.3) or from accumulated stormwater discharges during qualifying rain events. The "qualifying rain event" is a single storm that produces at least 0.5 inch of rainfall. A qualifying rain event may occur over multiple days. A rain event is considered to have ended when no measurable precipitation (i.e., less than 0.01 inch) is recorded within a consecutive 48-hour period. Weather tracking must be conducted in advance as described in Section 4.4.1 to determine if a qualifying rain event is forecasted to produce 0.5 inch, or more, of precipitation.

Additional information on weather tracking is provided in Section 4.4.1. Rain gauge reading must be made before, during, and after storm events from an onsite rain gauge. See Section 4.5 for additional information on rain gauge readings.

The Caltrans stormwater site inspector and contractor inspector must coordinate activities to select the sampling locations and schedule the time to meet for collection of simultaneous samples for QA/QC purposes.

Caltrans requires a minimum of three effluent samples must be collected from each representative discharge point (defined in Section 7.3) each day during a storm event forecasted to be a qualifying rain event, even if the storm event has not yet produced

0.5 inch of rain on the day of sampling. Sampling should start immediately after the flow begins or as soon as possible thereafter. It is preferable that the three rounds of sampling are done over the first three hours of the flow; however, depending on the time of day or other dictating conditions in the field, the three rounds of sampling could be done over a shorter period of time to ensure that three samples are collected daily per location. Samples must be analyzed for pH and turbidity. Samples are to be collected during project working hours from representative discharge points. Discharges from a project site can occur anytime during a rain event, but may not occur for some time after the start of the rainfall. Therefore, the site will need to be monitored throughout the day when rain is falling. Sample collection should not be performed during dangerous weather conditions, such as flooding and electrical storms as described in Section 4.1.2.

For sites with stored or contained stormwater (accumulated stormwater) that may discharge after operating hours, samples should be collected prior to the discharge during working hours as a contingency. During discharge of accumulated stormwater, monitoring must be performed daily when discharging, regardless of project risk level. A minimum of three samples per day must be collected and analyzed for pH and turbidity. The appropriate number and type of QA/QC samples also must be collected (see Section 4.9).

For Risk Level 2 and Risk Level 3 projects, Caltrans requires receiving water monitoring where stormwater discharges cannot be sampled before a direct discharge to receiving water. For these projects, Caltrans-required receiving water monitoring must be performed each time stormwater discharge sampling is required (i.e., three samples each day during a qualifying rain event or during a rain event forecasted to be a qualifying rain event). Receiving water samples must be collected as described in Section 10.4. Receiving water samples must be analyzed for pH and turbidity. Analysis must be performed according to the test methods, RLs, and reporting units specified in Table 4-2. For Risk Level 3 sites for which stormwater has direct discharge into a receiving water and that exceed a receiving water monitoring trigger, the receiving water also must be subsequently monitored for pH, turbidity, and SSC (if turbidity daily average exceeds the receiving water monitoring trigger), and any additional parameters for which monitoring is required by RWQCB for the duration of coverage under the CGP. See Section 10 for further information on receiving water monitoring.

Analysis must be performed according to the test methods, detections limits, and reporting units specified in Table 4-2.

Risk Level 3 projects that disturb 30 acres or more and directly discharge stormwater into a designated impaired receiving water body must also conduct a bioassessment of receiving waters. Caltrans will conduct pre-project and post-project construction bioassessments when required. "Designated impaired receiving waters" requiring bioassessment are defined as freshwater wadeable streams that are either:

- Listed by SWRCB or EPA as impaired due to sediment, and/or are a tributary to any downstream water body that is listed for sediment; and/or
- Have the beneficial uses SPAWN, COLD, and MIGRATORY.

7.3 Where to Monitor

Samples must be collected from representative discharge points as defined below. Discharge point(s) are the sites where the construction site's stormwater flows off site, whether to a municipal separate storm sewer system or receiving water body. Discharge points could include catch basin inlets, sheet flow, culverts, or outfalls. For sites with stored or contained stormwater, samples must be collected from discharges of stored or contained stormwater subsequent to a qualifying rain event. For projects where stormwater discharges cannot be sampled before a direct discharge to receiving water, Caltrans requires receiving monitoring sampling. A project's discharge points are identified in its SWPPP Section 700. Stormwater discharge locations are shown on the WPCDs attached to the project SWPPP.

Monitoring for stormwater effluent at Caltrans project sites must be conducted from representative locations,[3] selected to characterize discharges associated with the

[3] The CGP in Section I.5.a of Attachments D and E requires that sampling and analysis of stormwater discharges be performed "to characterize discharges associated with construction activity from the entire project disturbed area". Section I.5.b of CGP Attachment D and E further defines that effluent samples must be collected at "all discharge points where stormwater is discharged off site." However, Section I.5.c of Attachment D and E states that "stormwater discharge collected and observed must represent the effluent in each drainage area based on visual observation of the water and upstream conditions." An example is provided in a footnote stating that, 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 parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear. This example infers that all discharge points, such as those through a silt fence, should not be sampled, but those that are representative of certain conditions must be sampled. This implies that samples do not have to be collected from all discharge points but only those representative of effluent in each drainage area. Caltrans has determined that when considering all these separate requirements together, sampling will be performed of selected discharge points that are representative of all discharges associated with construction activity from the entire project disturbed area, considering visual observations of the water and upstream conditions. Representative discharge sampling is considered to meet permit requirements with limited personnel, time, and financial resources. In addition, because a typical Caltrans highway construction project is linear in nature with many discharges points, sampling every discharge point at these sites would not be feasible within a single work day. Therefore, representative sampling prioritizes the discharge points so that the highest priority or key discharge points can be sampled during the precipitation event. The goal of the representative location discharge sampling is to efficiently use all of the resources, information, and expertise available so that the data collected meets the permit requirement for characterization of discharges associated with construction activities.

construction activity from the entire project site. Selection of sampling locations therefore must be based on knowledge of the features or conditions of the construction site and existing construction activities.

Representative sampling for a Caltrans project is based on sampling 20 percent of the project discharge points per qualifying rain event. If 20 percent of the total discharge locations results in less than five locations to be sampled, then a minimum of five (5) locations (or all discharge points if less than five) must be sampled per qualifying rain event. Although the default is to sample 20 percent with a minimum of five locations, samples from additional locations should be collected if the rain event and working hours allow.

The WPC manager selects representative monitoring points to be sampled based on a project's site conditions and in-progress construction activities. Representative monitoring points must be selected from the following categories, as applicable:

- Discharge points from drainage areas with the highest percentages of disturbed soil areas.
- Discharge points from drainage areas where construction activities in progress could have an impact on stormwater runoff pH.
- At least one monitoring point from drainage areas where the disturbed soil areas have been stabilized.

If construction activity has not started within the drainage area at a monitoring location, and there is no disturbed soil within a drainage area, monitoring from the stormwater discharge point from that drainage area is not required. The monitoring locations are selected by the WPC manager for every forecasted qualifying rain event and included on the REAP for the storm event.

If turbidity test results from the selected monitoring locations exceed 200 NTU or pH test results are outside the range of 6.5-8.5, the WPC manager will select additional monitoring locations for the next monitoring event. The additional monitoring locations will include another 30 percent of the project discharge locations so that 50 percent of all discharge locations will be sampled and tested. The additional locations will be selected based on drainage areas with the highest percentages of disturbed soil area.

If the average value of the turbidity test results for a monitoring event from any selected location exceeds 250 NTU or pH test results are outside the range of 6.2-8.8, all

stormwater discharge locations must be sampled and tested during the next qualifying rain event.

Receiving waters also must be monitored upstream and downstream of the construction site's discharge point in the receiving water for Risk Level 3 sites that exceed a Receiving Water Monitoring Trigger, when stormwater has direct discharge into receiving waters. The WPC manager determines the exact monitoring locations. See Section 10 for additional information on receiving water monitoring.

7.4 How to Monitor

Manual grab sampling techniques will be used to collect samples. See Section 4.6.4 for detailed information on grab sample collection and analysis for pH and turbidity. Samples must be collected such that they are representative of the flow and characteristics of the discharge. The sampled stormwater discharge should represent the effluent in each drainage area, based on visual observation of the water and upstream conditions.

7.5 Rain Gauge Readings

Rain gauge readings must be made from the onsite rain gauge before, during, and after storm events, and the event rainfall total must be computed for comparison to the Qualifying Storm (greater than or equal to 0.5 inch event total) and the Compliance Storm Event criteria (see Section 7.6.1). Refer to the manufacturer's instructions for operation of the rain gauge installed on site.

For verification purposes the CGP also requires recording of rain gauge readings from a nearby government-operated rain gauge. These gauges may be operated by local, regional, state, or national agencies, such as county flood control districts or the NWS. See NWS' website at: http://www.wrh.noaa.gov/.

7.6 Data Evaluation, Follow-up, and Reporting

7.6.1 Data Evaluation

Once pH and turbidity sampling and analysis are completed, the daily average (arithmetic mean) of the sample results from each representative discharge point is calculated and compared to NALs and, for Risk Level 3 sites with direct discharges to surface waters, to Receiving Water Monitoring Triggers (see Table 4-2). See Section 4.12.1 for information on calculating daily averages. When specifically required by a RWQCB, results must also

be compared to TMDL and/or Waste Load Allocations. In the event a parameter exceeds TMDL and/or Waste Load Allocations, follow RWQCB-required reporting instructions.

For accumulated stormwater discharges (e.g., stormwater held in a holding pond), Caltrans requires that the turbidity of any effluent sample must not exceed 200 NTU. The pH value of any effluent sample must be within the range of 6.7 to 8.3 pH units. Corrective measures must be implemented if turbidity or pH sample results exceed these limits (see Section 7.6.4 for additional information on implementing corrective measures).

The event rainfall total computed from the onsite rain gauge must be compared to the Qualifying Rain Event (greater than or equal to 0.5 inch event total) and the Compliance Storm Event criteria. Comparing the rain gauge reading to the qualifying storm event criteria will determine if the rainfall event was a qualifying rain event during which effluent monitoring is required. Comparing the rain gauge reading to the Compliance Storm Event criteria will determine if the storm event exceeds the Compliance Storm Event. For Risk Level 3 projects with direct discharges to receiving water, receiving water monitoring is required unless a Receiving Water Monitoring Trigger exceedance occurs during a storm event that is equal or greater than a Compliance Storm Event.

The Compliance Storm Event for Risk Level 3 sites with direct discharges to receiving water is the 5-year, 24-hour storm event (expressed in inches of rainfall), as determined using maps found at the following locations:

- Isopluvials of 5-year, 24-hour precipitation for the northern half of California in tenths of an inch (divide number on map by 10 to get inches) are available at: http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif.
- Isopluvials of 5-year, 24-hour precipitation for the southern half of California in tenths of an inch (divide number on map by 10 to get inches) are available found at: http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif.

Compliance storm event verification must be done by reporting the onsite rain gauge readings, with verification from nearby governmental rain gauge readings. See Section 11.2 for reporting of rainfall event totals to document the Compliance Storm Event for cases where there is an exceedance of a Receiving Water Monitoring Trigger at Risk Level 3 sites with direct discharges to receiving water.

7.6.2 Monitoring and Reporting Run-on

Run-on from surrounding areas must be monitored and reported if there is reason to believe run-on may contribute to an exceedance of NALs or Receiving Water Monitoring Triggers. See Section 4.12.3 for additional information.

7.6.3 Assessing the Need for Corrective Measures

Sample results are compared to NALs for Risk Level 2 and 3 sites and to Receiving Water Monitoring Triggers for Risk Level 3 sites with direct discharges to receiving water, as defined in Table 4-2. If stormwater discharges exceed an NAL or a Receiving Water Monitoring Trigger, the source needs to be identified and corrective measures implemented. See Section 4.12.4 for additional information.

7.6.4 Implementing Corrective Measures

If the project site or run-on is found to be contributing to an NAL or Receiving Water Monitoring Trigger exceedance, the following steps should be taken as soon as possible:

1. Notify the RE and submit required forms as described in Section 11.1 and Section 11.2.

2. Repair or replace any BMP that has failed, resulting in a discharge and/or elevated levels of pH or turbidity in the runoff.

3. Improve maintenance at all BMPs that did not function as designed, resulting in a discharge and/or elevated levels of pH or turbidity in the runoff.

4. Implement BMPs in areas identified as generating discharges or sources of elevated pH or turbidity.

5. Implement additional, alternative, or redesigned BMPs to provide an effective combination of control measures on the site.

6. Identify the source of run-on resulting in a discharge and/or elevated levels of pH or turbidity in project site runoff.

7.6.5 Reporting

Complete the following forms and submit to the RE as detailed in Section 11:

Prior to storm event or monitoring:

- CEM-2045 Rain Event Action Plan form (if required)
- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters (if required)

During or after monitoring:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form, and
- CEM-2061 Notice of Discharge Report form (if required)
- CEM-2062 NAL Exceedance Report form (if required)

See Section 11 for detailed information on reporting and recordkeeping requirements.

8 RWQCB-REQUIRED MONITORING

8.1 Permit Requirements

RWQCBs enforce the CGP and retain discretionary authority over certain issues that may arise from the discharges in their respective regions. RWQCB may issue orders (including NPDES permits) with additional monitoring and sampling requirements. The orders could regulate stormwater discharges, non-stormwater discharges (i.e., dewatering), receiving water monitoring, etc.

The CGP does not apply to discharges of stormwater within the Lake Tahoe Hydrologic Unit. The Lahontan RWQCB has adopted its own permit to regulate stormwater discharges from construction activity in the Lake Tahoe Hydrologic Unit (RWQCB 6SLT; Caltrans Districts 3 and 10). Owners of construction projects in this watershed must apply for the Lahontan RWQCB permit rather than the statewide CGP. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), details of which are available online at:
http://www.swrcb.ca.gov/rwqcb6/board_decisions/adopted_orders/2005/docs/r6t_2005_0007.pdf.

Lahontan RWQCB Order No. R6T-2005-007, NPDES No. CAG616002 requires analysis of stormwater discharge samples in the Lake Tahoe region for settable solids, turbidity, and non-visually detected pollutants. The Order establishes NELs for total nitrogen, total phosphorus, total iron, turbidity, and oil and grease.

TMDLs and Waste Load Allocations. Projects located within the watershed of a Clean Water Act (CWA) § 303(d) impaired water body, for which a TMDL for suspended sediment has been adopted by the State of California and approved by EPA, must comply with the approved TMDL if "construction activity" or land disturbance is identified as a source of sediment. If so, the TMDL may include a specific waste load allocation for this activity/source. The TMDL Implementation Plan may require additional BMPs, additional monitoring activities, and/or compliance with an applicable waste load allocation and implementation schedule. If a specific waste load allocation has been established that would apply to a specific discharge, RWQCB may adopt an order requiring specific implementation actions necessary to meet that allocation. In the instance where an approved TMDL has specified a general waste load allocation for construction stormwater discharges, but no specific requirements for construction sites

have been identified in the TMDL, RWQCB must be consulted to confirm that adherence to a SWPPP that meets the requirements of the CGP will be consistent with the approved TMDL.

8.2 What and When to Monitor

Specific requirements for monitoring will be included in a RWQCB Order or TMDL Implementation Plan. For example, North Coast RWQCB (Region 1) has previously issued CWA §401 Water Quality Certifications to Caltrans projects requiring monitoring for pH, turbidity, temperature, dissolved oxygen, specific conductance, and total dissolved solids.

Sample collection and analysis protocols must conform to the test methods, detections limits, and reporting units specified in Tables 4-1 and 4-2, unless other methods are specified by RWQCB.

8.3 Where to Monitor

Monitoring locations will be based on the specific requirements of an order issued by RWQCB, or requirements specified in a TMDL Implementation Plan. If monitoring locations are not specified, see Section 10 for receiving water monitoring.

8.4 How to Monitor

Monitoring methods will be based on the specific requirements of a RWQCB-issued order, or requirements specified in a TMDL Implementation Plan. However, typically manual grab sampling techniques will be used to collect samples. Grab sample collection is described in Section 4.6.4. For receiving water sampling, see Section 10.

8.5 Data Evaluation, Follow-up, and Reporting

Data evaluation, follow-up, and reporting will be based on the RWQCB-issued order and the type of discharge. For typical data evaluation requirements, see Section 5 for non-visual pollutants, Section 6 for non-stormwater discharges, Section 7 for information for stormwater discharges (pH and Turbidity), Section 9 for ATS discharges, and Section 10 for receiving waters.

Projects located within the watershed of a CWA 303(d) impaired water body, with an approved TMDL from EPA, must comply with the approved TMDL if it identifies

"construction activity" or land disturbance as a source of the pollution. The website links to watersheds with TMDLs and the list of 303(d) water bodies is provided below.

Watersheds with TMDLs:
http://www.swrcb.ca.gov/water_issues/programs/tmdl/.

CWA § 303(d)-listed Water Bodies:
http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

Complete the following forms and submit to that RE as detailed in Section 11:

Prior to storm event or sampling:

- CEM-2045 Rain Event Action Plan form (if required)
- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters (if required)

During or after sampling:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form
- CEM-2061 Notice of Discharge Report form (if required)
- CEM-2062 NAL Exceedance Report form (if required)

See Section 11 for detailed information on reporting and recordkeeping requirements.

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9 ACTIVE TREATMENT SYSTEM CALTRANS OVERSIGHT MONITORING PROTOCOLS

9.1 Active Treatment System Overview

The use of an ATS may be necessary on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion, or under circumstances where stormwater discharges leaving the site may cause or contribute to an exceedance of a receiving water quality standard. An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to reduce turbidity caused by fine suspended sediment. Additionally, it may be appropriate to use an ATS when site constraints prohibit the construction of a correctly-sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

An ATS is operated in one of two modes, either batch or flow-through. In batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. In flow-through treatment, water is pumped into the ATS directly from the runoff collection system or stormwater holding pond, where it is treated and filtered as it flows through the system, and is then continuously discharged.

The CGP requires visual monitoring, operational and (effluent) compliance monitoring, and, for an ATS operating in batch mode, toxicity monitoring. Guidance to perform the CGP-required monitoring is provided in Appendix D. This section presents only additional Caltrans-required monitoring, beyond what is required by the CGP. This monitoring of the ATS is to provide QA and independent verification by Caltrans, to ensure that the ATS instrumentation, which automatically measures and records effluent water quality data, is working properly.

9.2 What and When to Monitor

When an ATS is discharging water from the project site, Caltrans requires effluent grab samples must be collected and analyzed for pH and turbidity on a daily basis. Collect a minimum of three effluent grab samples per day and test for pH and turbidity using a handheld meter to verify the continuous pH and turbidity monitoring.

The Caltrans stormwater site inspector and contractor inspector must coordinate activities to schedule the time to meet for collection of simultaneous samples for QA/QC purposes.

The contractor must notify the RE at least 24 hours prior to potential ATS sampling events.

9.3 Where to Monitor

The effluent samples must be collected from the discharge pipe or another location representative of the nature of the discharge.

9.4 How to Monitor

The required grab samples must be collected from the outlet pipe such that they are representative of the flow and characteristics of the discharge. Grab sampling techniques are described in detail in Section 4.6.4.

9.5 Data Evaluation, Follow-up, and Reporting

9.5.1 Data Evaluation

Results of effluent testing for pH and turbidity are compared to the daily recorded water quality test results from the ATS operator to determine if further action is required. To identify substantial differences between the monitoring test results and the ATS operator's daily recorded test results, the RPD between the data sets is calculated. See Section 4.12.2 for detailed information on calculating RPD.

9.5.2 Assessing the Need for Corrective Measures

If the RPD of the monitoring test results and the ATS daily recorded test results are greater than 25 percent, then the WPC manager or other personnel must evaluate possible causes of the discrepancy and determine the probable cause for the non-verification.

9.5.3 Implementing Corrective Measures

Corrective actions must be implemented as soon as possible. The test results, sample collection methods and timing, and testing methods should be compared with the ATS operator, and potential corrective measures discussed with the ATS operator.

Additional BMPs may be needed onsite so that flow receives additional treatment prior to the ATS.

9.5.4 Reporting

An evaluation of the ATS water quality sample analytical results must be submitted to the RE within five days of the ATS sampling event.

Complete the following forms and submit to RE as detailed in Section 11:

Prior to ATS sampling:

- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters (if required)

During or after sampling:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form
- CEM-2061 Notice of Discharge Report form (if required)
- CEM-2063 Numeric Effluent Limitation Violation Report – ATS Discharges form (if required)

See Section 11 for detailed information on reporting and recordkeeping requirements.

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10 RECEIVING WATER MONITORING

10.1 Permit Requirements

Receiving water monitoring is required by the CGP for all Risk Level 3 projects that exceed a Receiving Water Monitoring Trigger and have direct discharge into receiving waters (also referred to as "waters of the state"). A receiving water is a water body, such as a creek, river, lake, ocean, or other water course into which stormwater is discharged. Stormwater runoff from the construction site is not considered a direct discharge to a receiving water if it first flows through a MS4 or a separate stormwater conveyance system where there is co-mingling of site stormwater with offsite (non-Caltrans) sources. Upon exceedance of a Receiving Water Monitoring Trigger, for Risk Level 3 project sites with direct discharges to receiving water, the receiving waters must be subsequently monitored for pH, turbidity, and SSC (if turbidity daily average exceeds Receiving Water Monitoring Trigger) for the duration of the project's coverage under the CGP.

The CGP allows RWQCBs the authority to require additional monitoring and reporting program requirements, including sampling and analysis of discharges to sediment-impaired water bodies; see Section 8 for RWQCB requirements.

For Risk Level 2 and Risk Level 3 projects, Caltrans requires receiving water monitoring where stormwater discharges cannot be sampled prior to a direct discharge to receiving water. This Caltrans requirement is not related to Receiving Water Monitoring Triggers. See Section 7 for sampling requirements for this Caltrans-required receiving water sampling when stormwater discharge sampling cannot be performed.

10.2 What and When to Monitor

When the discharge of a Risk Level 3 project that has direct discharge into receiving waters is found to exceed a Receiving Water Monitoring Trigger in a discharge (effluent) sample, receiving water samples must be collected and analyzed for pH, turbidity, and SSC (if turbidity daily average exceeds Receiving Water Monitoring Trigger) for the duration of coverage under the CGP. Analysis must be performed according to the test methods, RLs, and reporting units specified in Table 4-2.

For any additional receiving water monitoring required by RWQCB[4], conduct monitoring as specified by RWQCB-issued order or TMDL Implementation Plan. Analysis must be performed according to the test methods, RLs, and reporting units specified in Table 4-4, unless otherwise specified in a RWQCB- issued order. Suspended solids and turbidity levels are highly variable in receiving water bodies, especially during wet-weather events. Collecting a single sample at the upstream and downstream locations during a discharge event may not provide a set of samples that represent the typical conditions at either location. Therefore, a minimum of three samples should be collected daily during qualifying rain events.

Receiving water samples should be collected following collection of stormwater discharge samples (daily during qualifying rain events; see Section 7), assuring that receiving water monitoring occurs after the project site's stormwater begins to discharge into the receiving water. Sample collection should be conducted only during scheduled project working hours. Sample collection should not be performed during dangerous weather conditions, such as flooding and electrical storms, or when site conditions are unsafe.

10.3 Where to Monitor

Both upstream and downstream samples from a discharge location must be collected. If two or more discharge locations discharge to the same receiving water, the receiving water may be sampled at a single upstream and downstream location.

- **Upstream/up-gradient receiving water samples:** Samples must be collected from a representative and accessible receiving water location as close as possible and upstream from the effluent discharge point.
- **Downstream/down-gradient receiving water samples:** Samples must be obtained from a representative and accessible receiving water location downstream from the effluent discharge point. The receiving water sampling location must be as close as possible to the effluent discharge point, but also where the discharge is fully mixed with the receiving water stream.

The upstream location is required to establish the water quality of the receiving water prior to coming in contact with the discharges from the construction site. The

[4] For example, the North Coast Regional Water Quality Control Board (Region 1) has issued multiple 401 Water Quality Certifications for Caltrans projects requiring effluent, upstream (background), and downstream monitoring four times daily for flow, pH, temperature, dissolved oxygen, total dissolved solids, turbidity, and specific conductance.

downstream location is required to establish the water quality of the receiving water after coming in contact with the discharges.

Upstream and downstream receiving water sampling may take place on a variety of water bodies, including rivers and creeks, lakes, or tidally-influenced bays, estuaries, and sloughs. Each type of water body will have a unique pair of upstream/downstream sampling points.

10.3.1 Rivers and Creeks

Establishing upstream and downstream monitoring locations on rivers and creeks is relatively straightforward, because the flow typically occurs in the downstream direction. Exceptions include tidally influenced or flow-controlled rivers and creeks; for such situations, see discussion of bays, estuaries and sloughs in Section 10.3.3.

The upstream sampling location should be established at a point along the stream bank that is upstream of all possible direct discharge points from the construction site. The actual samples should be collected in or as near as possible to the main stream flow/current. If the discharge creates a visible plume in the river or creek, avoid collecting a sample near this plume.

The downstream sampling location should be established along the stream bank downstream of all direct discharge points from the construction site. Inspect the stream bank (and opposite stream bank if possible) for discharge points from other sites or sources that could add pollutants to the downstream sampling location, and avoid locating downstream sampling locations where they may be affected by other discharges. If possible, the location should be far enough downstream so the project discharge(s) has mixed with the upstream flows, but not so far downstream that other discharges may affect stream quality. Avoid establishing the sampling location near the point of discharge or in the initial zone of dilution (within 5 meters or 20 feet). Establishing the sampling point at least 15 meters (50 feet) downstream from the discharge is a good general rule.

Be prepared to change locations for each event. The actual downstream sampling location will depend on the size of the plume and most likely vary for each event. The size of the plume will depend on the upstream flow rate and associated sediment load as well as the discharge flow rate and associated sediment load. Section 10.4 includes further details of the sample collection process.

10.3.2 Lakes

Establishing upstream and downstream stations along lakes presents a challenge because there is no consistent flow direction, and often there is no discernible flow pattern. Wind direction usually dictates the direction of flow, if any. Sampling personnel should expect to identify both the upstream and downstream locations during each individual sampling event.

The upstream sampling location should be established well away from any discharge point. Wave action may stir up sediments near the shore, so samples should be collected out from the shore and away from any visual plume.

The downstream sampling location should be established based on the direction the plume travels. Samples should be collected at the point closest to the discharge where the plume has mixed with the surrounding water, but before the plume commingles with another discharge or with sediment stirred up by the action of waves. If the plume heads out from shore, sampling may have to be performed from a boat.

10.3.3 Bays, Estuaries, and Sloughs (Tidally Influenced Waters)

For bays, estuaries, and sloughs, the flow direction is dictated by tides and/or wind. The direction of the flow typically will change throughout the day as the tide flows in and out. Sampling personnel should consult daily tide charts to know whether the tide is coming in or going out. Upstream and downstream locations will depend on the flow patterns at the time sampling takes place.

For linear water bodies (estuaries, sloughs, rivers, creeks) that are tidally influenced, collect samples on the outgoing (ebb) tide whenever feasible.

The upstream sampling location should be established at a point along the shore that is upstream of all possible direct discharge points from the construction site. Wave or tidal action may stir up sediments near the shore so samples should be collected out from the shore and away from any other visual plume.

The downstream sampling location should be established based on the direction the plume travels. Samples should be collected at the point closest to the discharge where the discharge has mixed with the surrounding water, but before the plume commingles with either another discharge or sediment stirred up by the action of waves. If the plume heads out from shore, sampling may have to be performed from a boat.

10.3.4 General Considerations

In general, each potential monitoring location should be visited in advance to confirm the expected site characteristics and verify whether the site is suitable for monitoring. Access into the monitoring locations must be feasible, practical, legal, and safe. Ease of vehicle and personnel access to the monitoring locations should be assured for the full range of weather conditions that may be encountered. Safe access must be confirmed, especially during wet-weather conditions. For example, ensure that the access point and available parking are at a safe distance from traffic, that any roads to the sampling location are adequate and reliable (e.g., limited potential to be muddy or flooded during wet weather), and that access does not require crossing private property. Check with local agencies as to whether any permits will be required to gain legal access to the sites.

When possible, a visit should be conducted during a storm, when the in-stream flow conditions can be observed. A wet-weather visit can provide valuable information regarding logistical constraints that may not be readily apparent during dry weather. However, a dry weather visit should also be conducted to observe any non-stormwater flows. A number of potential sampling locations will have to be identified at constructions sites along lakes, bays, estuaries, and sloughs, as the actual direction of the flow will not be known until the time of the discharge.

Information to gather during a site visit may include whether an appropriate sampling location exists, potential safety issues, and site access. In addition, it is useful to identify potential contributions of runoff from adjacent areas and in-stream conditions such as other point sources, backwater effects, tidal or wind influences, and poorly mixed flows.

Monitoring locations for upstream and downstream sampling stations may vary with each event. Field sampling and testing personnel should be prepared to modify sampling locations to maximize the representativeness of the samples. Sampling locations must be identified on form CEM-2045 for each monitoring-event. Detailed field notes and or photographs should be used to document the conditions and reasons for selecting a specific monitoring location, including GPS coordinates, post miles, etc. to define locations. Photographs are helpful to show the discharge(s), in-stream conditions, and sample collection methods.

10.4 How to Monitor

10.4.1 Grab Sample Collection

Manual grab sampling techniques will be used to collect receiving water samples. A grab sample is an individual sample collected at one specific site at one point in time. Analysis of a grab sample provides a "snapshot" of the water's quality. Manual grab samples are typically collected by direct submersion of each individual sample bottle into the flow stream. See Section 4.6 for additional detail on sample collection techniques.

When collecting samples at the upstream/downstream stations, samples should be collected at the downstream station first. Sampling may disturb the bottom sediment. If the upstream sample is collected first, the disturbed sediment may be carried downstream and possibly impact the downstream sample. At both sites, face upstream to collect a sample, and always collect the sample upstream of the sampler's body and/or sampling vessel.

Wading into a water body to collect a sample should be avoided when feasible. Wading will disturb the bottom sediment and increase the suspended sediment levels in the water column where the samples will be collected. Wading into a river or creek is also dangerous during wet-weather events because flow rates are often higher. Wading should only be performed if the flow depth is less than 1 foot. Approach the sampling point from the downstream direction.

Standing on the bank and using a sampling pole to collect a sample is a preferred technique when it is necessary to reach into a stream for the sample. A boat can be used to access sites out in lakes, bays, estuaries, sloughs, and large slow-moving rivers.

Samples should be collected from below the surface of the receiving water body, at a depth of approximately 4 inches, if possible.

10.4.2 Measurement of pH and Turbidity

When feasible, pH and turbidity measurements should be made in the field by immersing the probe directly into the receiving water body, below the surface, at a depth of approximately 8 inches. The probe may be attached to the end of the sampling rod in order to reach the receiving water sampling location. When that is not possible, the measurements should be made from a sample collected in an intermediate sample container from a depth of approximately 4 inches. If pH and turbidity measurements are taken using separate meters, the measurements should be made in separate containers to

ensure sample integrity. Samples that are used to measure pH and turbidity should not be sent to the laboratory for other analyses.

10.4.3 Sampling and Analysis Requirements

See Tables 4-1 and 4-2 for sampling and analysis requirements.

10.5 Data Evaluation, Follow-up, and Reporting

10.5.1 Data Evaluation

The CGP requires that projects be subject to ensuring that all stormwater discharges and authorized non-stormwater discharges to any surface or groundwater will not adversely affect human health or the environment. In addition, stormwater discharges and authorized non-storm water discharges may not cause or contribute to an exceedance of any applicable WQOs or water quality standards. Water quality standards are published in Basin Plans adopted by each RWQCB, the California Toxics Rule, the National Toxics Rule, and the Ocean Plan. Projects located within the watershed of a CWA 303(d) impaired water body, with an approved TMDL from EPA, must comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution. The website links to watersheds with TMDLs and the list of 303(d) water bodies is provided below.

Watersheds with TMDL:
http://www.swrcb.ca.gov/water_issues/programs/tmdl/.

CWA 303(d)-listed Water Bodies:
http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

The applicable water quality standards for a given receiving water can be determined by consulting the Regional "Water Quality Control Plans" (commonly called "Basin Plans"), which are available on each RWQCB website. The WQOs are generally specified in Chapter 3 of the Basin Plan, listed alphabetically by constituent. The WQOs listed in a Basin Plan generally cover all surface water bodies within that region; exceptions for specific water bodies are listed under the WQOs for each constituent. Table 10-1 lists links to each of the various regional Basin Plans.

Table 10-2 summarizes each region's turbidity WQOs. Table 10-3 summarizes each region's pH WQOs.

Table 10-1. Regional Water Board Basin Plans Online Resources.

Regional Water Quality Control Board	Caltrans District[1]	Basin Plan Online Resource
1 (North Coast)	1, 2, 3, 4	http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan
2 (San Francisco Bay)	4	http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml
3 (Central Coast)	4, 5, 7	http://www.waterboards.ca.gov/centralcoast/publications_forms/publications/basin_plan/
4 (Los Angeles)	7	http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/
5 (Central Valley)	1, 2, 3, 4, 5, 6, 10	http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/
6 (Lahontan)	2, 3, 6, 7, 8, 9, 10	http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/
7 (Colorado River)	8, 11	http://www.waterboards.ca.gov/coloradoriver/water_issues/programs/basin_planning/
8 (Santa Ana)	8, 12	http://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/index.shtml
9 (San Diego)	8, 11, 12	http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

[1] Caltrans districts in each Regional Water Quality Control Board region are illustrated in the *Field Guide to Construction Site Dewatering* (Caltrans, 2001).

Table 10-2. Regional Water Board Basin Plans, Water Quality Objectives for Turbidity.

Regional Water Quality Control Board	Caltrans District[1]	Water Quality Objective	Background/ Natural Turbidity	Maximum Increase
1 (North Coast)	1, 2, 3, 4	Based on background	All levels	20%
2 (San Francisco Bay)	4	Based on background	> 50 NTU	10%
3 (Central Coast)	4, 5, 7	Based on background	0-50 JTU 50-100 JTU > 100 JTU	20% 10 JTU 10%
4 (Los Angeles)	7	Based on background	0-50 NTU >50 NTU	20% 10%
5 (Central Valley)	1, 2, 3, 4, 5, 6, 10	Based on background	0-5 NTU 5-50 NTU 50-100 NTU > 100 NTU	1 NTU 20% 10 NTU 10%

Table 10-2. (Continued)

Regional Water Quality Control Board	Caltrans District[1]	Water Quality Objective	Background/ Natural Turbidity	Maximum Increase
6 (Lahontan)	2, 3, 6, 7, 8, 9, 10	Based on background	All levels	10% Additional water quality objectives for turbidity apply for certain water bodies specified in the Basin Plan (e.g., the turbidity shall not be raised above 3 NTUs mean of monthly means).
7 (Colorado River)	8, 11	Based on background	N/A	N/A
8 (Santa Ana)	8, 12	Based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%
9 (San Diego)	8, 11, 12	Surface waters, 20 NTUs All others, based on background	0-50 NTU 50-100 NTU > 100 NTU	20% 10 NTU 10%

Notes:
Source: CGP Fact Sheet Table 1
[1] Caltrans districts in each Regional Water Quality Control Board region are illustrated in the *Field Guide to Construction Site Dewatering* (Caltrans, 2001).
JTU = Jackson turbidity unit
NTU = nephelometer turbidity unit
N/A = not applicable
> = greater than
% = percent

Table 10-3. Regional Water Board Basin Plans, Water Quality Objectives for pH.

Regional Water Board	Caltrans District[1]	Water Quality Objective
1 (North Coast)	1, 2, 3, 4	The pH limits are listed in Table 3-1 of the Basin Plan. For other waters not listed in Table 3-1 of the Basin Plan and where pH objectives are not prescribed, 6.5 ≤ pH ≤ 8.5. AND Normal ambient pH levels shall not be changed greater than 0.2 units in waters with designated marine (MAR) or saline (SAL) beneficial uses nor greater than 0.5 units within the range specified above in fresh waters with designated COLD or WARM beneficial uses.
2 (San Francisco Bay)	4	6.5 ≤ pH ≤ 8.5 AND Normal ambient pH levels shall not be changed greater than 0.5 units.

Table 10-3. Continued

Regional Water Board	Caltrans District[1]	Water Quality Objective
3 (Central Coast)	4, 5, 7	General objectives: 7.0 ≤ pH ≤ 8.5 For water with designated municipal and domestic supply (MUN), agricultural supply (AGR), water contact recreation (REC-1) and non-contact water recreation (REC-2), beneficial uses, 6.5 ≤ pH ≤ 8.3 Normal ambient pH levels shall not be changed greater than 0.5 units in waters with designated cold freshwater habitat (COLD) or warm freshwater habitat (WARM) beneficial uses nor greater than 0.2 units within the range specified above in fresh waters with designated marine (MAR) beneficial uses.
4 (Los Angeles)	7	6.5 ≤ pH ≤ 8.5 Inland surface waters ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge. Bays or estuaries ambient pH levels shall not be changed more than 0.2 units from natural conditions as a result of waste discharge.
5 (Central Valley)	1, 2, 3, 4, 5, 6, 10	6.5 ≤ pH ≤ 8.5 For Goose Lake, 7.5 ≤ pH ≤ 9.5
6 (Lahontan)	2, 3, 6, 7, 8, 9, 10	In fresh waters with designated beneficial uses of COLD or WARM, changes in normal ambient pH levels shall not exceed 0.5 pH units. For all others, 6.5 ≤ pH ≤ 8.5. In the hypolimnion of Eagle Lake, the pH shall not be depressed below 7.6 at any time. For all other Eagle Lake waters, changes in normal ambient pH shall not exceed 0.1 unit. For Honey Lake, the pH (based on the average of values from at least 3 samples from 3 different locations) shall not at any time be depressed below 8.0 nor raised above 10.0. For Little Truckee River, West Fork Carson River, East Fork Carson River, and Truckee River Hydrologic Units, Changes in normal ambient pH levels shall not exceed 0.5 unit. In Lake Tahoe, the pH shall not be depressed below 7.0 nor raised above 8.4. For certain water bodies Fallen Leaf Lake, Lake Tahoe Hydrologic Unit, pH shall be 6.5 - 7.9
7 (Colorado River)	8, 11	6.0 ≤ pH ≤ 9.0
8 (Santa Ana)	8. 12	Inland surface waters, 6.5 ≤ pH ≤ 8.5. Bays or estuaries, 7.0 ≤ pH ≤ 8.6 and ambient pH levels shall not be changed more than 0.2 units.
9 (San Diego)	8, 11, 12	For ocean waters, the pH value shall not be changed at any time more than 0.2 pH units from that which occurs naturally. Changes in normal ambient pH levels shall not exceed 0.2 units in waters with designated marine (MAR), or estuarine (EST), or saline (SAL) beneficial uses. Changes in normal ambient pH levels shall not exceed 0.5 units in fresh waters with designated cold freshwater habitat (COLD) or warm freshwater habitat (WARM) beneficial uses. In bays and estuaries, 7.0 ≤ pH ≤ 9.0 In inland surface waters, 6.5 ≤ pH ≤ 8.5

[1] Caltrans districts in each Regional Water Quality Control Board region are illustrated in the *Field Guide to Construction Site Dewatering* (Caltrans, 2001)

≤ = less than or equal to
≥ = greater than or equal to

To determine if the receiving water turbidity monitoring results exceed the RWQCB's Basin Plan WQOs, the upstream and downstream sample results are compared to the WQOs. For example, if a project located in RWQCB Region 1 has an upstream sampling result of 10 NTU and a downstream sampling result of 13 NTU (an increase of 30 percent), the turbidity WQO would be exceeded in all regions as shown in Table 10-2.

10.5.2 Assessing the Need for Corrective Measures

If a comparison of the upstream and downstream samples indicates a substantial increase in pH, turbidity, or SSC (i.e., concentration exceeds WQOs), the source needs to be identified and corrective measures identified. See Section 4.12.4 for additional information.

10.5.3 Implementing Corrective Measures

If the project site conditions or run-on from offsite are found to be contributing sediment, silt, or other RWQCB-specified constituent to the runoff, the following steps should be taken as soon as possible:

1. Repair or replace any BMP that has failed, resulting in a discharge and/or elevated levels of pH, turbidity, or SSC in the runoff.
2. Improve maintenance at all BMPs that did not function as designed, resulting in a discharge and or elevated levels of pH, turbidity, or SSC in the runoff.
3. Implement BMPs in areas identified as generating discharges or sources of elevated pH, turbidity, or SSC.
4. Implement additional, alternative, or redesigned BMPs to provide an effective combination of control measures on the site.

10.5.4 Reporting

See Section 11 for reporting and recordkeeping requirements.

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11 TIMELINE, REPORTING, AND RECORDKEEPING

This section summarizes the monitoring and sampling schedule by Risk Level. This section also describes recordkeeping and reporting requirements necessary to implement the CSMP.

11.1 Monitoring Timeline

All Caltrans SWPPP projects must conduct visual monitoring and runoff water quality sampling and testing to comply with the CGP. Table 2-1 summarizes the CGP requirements. A summary of the timeline of requirements is presented below.

11.1.1 Risk Level 1 Timeline for Storm-Based Monitoring

- Within two business days (**48 hours**) *prior* to each forecasted storm event:[5]
  - Conduct pre-storm inspections
- Within **first two hours** of discharge occurring during project working hours:
  - Collect non-visible pollutant samples (if required)
  - At least once each **24-hour period** during extended storm events:
  - Conduct stormwater BMP inspections
- Three samples **per day** (minimum) from accumulated stormwater discharges during qualifying rain events[6] and during *forecasted* qualifying rain events (even if the storm event has not yet produced 0.5 inch of rain on the day of sampling). Caltrans also requires collecting three samples **per day** from discharges of groundwater dewatering discharge:
  - Collect effluent (accumulated stormwater and groundwater discharge) samples

[5] The CGP requires a pre-storm inspection prior to a "qualifying rain event" which is defined as any event producing precipitation of 0.5 inch or more over the duration of the rain event. Because the size of a rain event cannot be accurately predicted, Caltrans requires a pre-storm inspection based on a forecasted storm event, which is defined as any rain event that is forecasted to produce 0.1 inch or more of precipitation within any 24-hour period. The trigger for a pre-storm event visual inspection is the same as for a Rain Event Action Plan: 50 percent or greater probability of producing 0.1 inch or more of precipitation within any 24-hour period in the project area based on the National Weather Service Forecast Office (National Oceanic and Atmospheric Administration).

[6] A qualifying rain event is defined as any event producing precipitation of 0.5 inch, or more, over the duration of the rain event.

- Perform field pH and turbidity measurements

- Within **24 hours** of a discharge event or discovery of evidence of a prior discharge:
  - Submit Notice of Discharge Report form (CE-2061) to the RE
- Within two business days (48 hours) after each qualifying rain event:[7]
  - Conduct post-storm inspections
- Within **48 hours** after collecting non-visible pollutant samples:
  - Submit field analysis measurements to the RE
- Within **30 days** of collecting non-visible pollutant samples:
  - Submit laboratory analyses to the RE

11.1.2 Risk Level 2 Timeline for Storm-Based Monitoring

- Within two business days (**48 hours**) ***prior*** to each forecasted storm event:[8]
  - Conduct pre-storm inspections
- Within **first two hours** of discharge occurring during project working hours:
  - Collect non-visible pollutant samples (if required)
- At least **once each 24-hour period** during extended storm events:
  - Conduct stormwater BMP inspections
- Three samples **per day** (minimum) from each representative monitoring location (defined in Section 7.3) and from accumulated stormwater discharges during qualifying rain events[2] and during *forecasted* qualifying rain events (even if the storm event has not yet produced 0.5 inch of rain on the day of sampling). Caltrans also requires collecting three samples **per day** from discharges of groundwater dewatering discharge:

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[7] A qualifying rain event is defined as any event producing precipitation of 0.5 inch, or more, over the duration of the rain event.

[8] The CGP requires a pre-storm inspection prior to a "qualifying rain event" which is defined as any event producing precipitation of 0.5 inch or more over the duration of the rain event. Because the size of a rain event cannot be accurately predicted, Caltrans requires a pre-storm inspection based on a forecasted storm event, which is defined as any rain event that is forecasted to produce 0.1 inch or more of precipitation within any 24-hour period. The trigger for a pre-storm event visual inspection is the same as for a Rain Event Action Plan: 50 percent or greater probability of producing 0.1 inch or more of precipitation within any 24-hour period in the project area based on the National Weather Service Forecast Office (National Oceanic and Atmospheric Administration).

  - Collect effluent (stormwater, accumulated stormwater, and groundwater discharge) samples
  - Perform field pH and turbidity measurements
- Within **24 hours** of a discharge event or discovery of evidence of a prior discharge:
  - Submit Notice of Discharge Report form (CEM-2061) to the RE
- Within two business days (**48 hours**) ***after*** each qualifying rain event:[9]
  - Conduct post-storm inspections
- Within **48 hours** after storm event:
  - Contractor submits NAL exceedance report (Numeric Action Level Exceedance Report, CEM- 2062) to the RE if the daily average NAL exceeded
- Within **10 days** after storm event:
  - RE submits testing results to SWRCB if the daily average NAL exceeded
- If NAL exceedance report is requested by RWQCB:
  - RE submits NAL exceedance report to RWQCB
- Within **48 hours** of collecting samples:
  - Submit field analysis measurements to the RE
- Within **30 days** of collecting samples:
  - Submit laboratory analyses to the RE

11.1.3 Risk Level 3 Timeline for Storm-Based Monitoring

- Within two business days (**48 hours**) ***prior*** to each forecasted storm event[10]:
  - Conduct pre-storm inspections

[9] A qualifying rain event is defined as any event producing precipitation of 0.5 inch, or more, over the duration of the rain event.

[10] The CGP requires a pre-storm inspection prior to a "qualifying rain event" which is defined as any event producing precipitation of 0.5 inch or more over the duration of the rain event. Because the size of a rain event cannot be accurately predicted, Caltrans requires a pre-storm inspection based on a forecasted storm event, which is defined as any rain event that is forecasted to produce 0.1 inch or more of precipitation within any 24-hour period. The trigger for a pre-storm event visual inspection is the same as for a Rain Event Action Plan: 50 percent or greater probability of producing 0.1 inch or more of precipitation within any 24-hour period in the project area based on the National Weather Service Forecast Office (National Oceanic and Atmospheric Administration).

- Within **first two hours** of discharge occurring during project working hours:
  - Collect non-visible pollutant samples (if required)
  - Conduct stormwater storm BMP inspections
- At least **once each 24-hour period** during extended storm events:
  - Conduct stormwater BMP inspections
- Three samples **per day** (minimum) from each representative sampling point (defined in Section 7.3) and from accumulated stormwater discharges during qualifying rain events[2] and during *forecasted* qualifying rain events (even if the storm event has not yet produced 0.5 inch of rain on the day of sampling). Caltrans also requires collecting three samples **per day** from discharges of groundwater dewatering discharge:
  - Collect effluent (stormwater, accumulated stormwater, and groundwater discharge) samples
  - Perform field pH and turbidity measurements
- Within **24 hours** of a discharge event or discovery of evidence of a prior discharge:
  - Submit Notice of Discharge Report form (CEM-2061) to the RE
- Within **two business days** (**48 hours**) after each qualifying rain event[11]:
  - Conduct post-storm inspections
- Within **48 hours** after storm event:
  - Contractor submits results to the RE
- If daily average NAL is exceeded, contractor submits NAL exceedance report (Numeric Action Level Exceedance Report, CEM- 2062) to the RE
- If NAL exceedance report is requested by RWQCB:
  - RE submits NAL exceedance report to RWQCB
- Within **five days** after storm event:
  - RE submits results to SWRCB

[11] A qualifying rain event is defined as any event producing precipitation of 0.5 inch, or more, over the duration of the rain event.

- Within **six hours** after daily average Receiving Water Monitoring Trigger exceedance (for site with direct discharge into a receiving water):
  - Contractor submits results to the RE
- When daily average Receiving Water Monitoring Trigger is exceeded (for site with direct discharge into a receiving water):
  - Sample upstream and downstream of discharge in receiving water
- Within **48 hours** of collecting samples:
  - Submit field analysis measurements to the RE
- Within **30 days** of collecting samples:
  - Submit laboratory analyses to the RE

11.2 Data Reporting

To facilitate data management, analysis, and the comparison of results to NALs/Receiving Water Monitoring Triggers, a standard system for data reporting should be followed for each project. Both electronic and hardcopy data must be filed in Category 20 of the project files in an organized and easily accessible fashion (see Section 11.3).

To keep the data organized, each monitoring site, location, and sampling event should be assigned a unique identification number. All the data should be organized and associated with these numbers. See Section 4.4.3 for additional information on assigning unique identification numbers.

The RE must be notified of sample testing results per the contract specifications. The RE will access the SWRCB's Storm Water Multi-Application and Report Tracking System (SMARTS) and electronically upload any required reports or field data. Results must be submitted to the RE within:

- 6 hours after a Receiving Water Monitoring Trigger exceedance is identified (Risk Level 3 sites with direct discharge to receiving water only)
- 48 hours after an NAL violation is identified (Risk Level 2 or 3 sites)
- 48 hours of field analysis measurements (with no exceedance)
- 30 days of collecting samples for laboratory analyses

All test results shall be documented on either the CEM-2052 Stormwater Sample Field Test Report form, or the laboratory report, and may be entered on the CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form. These forms shall be considered accountable documents. If an error is made on an accountable document, the individual responsible for the error shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated by the individual responsible.

A copy of all water quality analytical results and QA/QC data shall be submitted to the RE within 48 hours of sampling for field analyzed samples, and within 30 days for laboratory analyses. For field tests, the submitted information shall include a signed copy of the Sample Information, Identification and Chain-of-Custody Record (CEM-2050), Stormwater Sample Field Test Report (CEM-2052), and an updated Stormwater Sampling and Testing Activity Log – Optional Form (CEM-2051).

Attribute data (also known as meta data) also should be collected to assist with data interpretation. The attribute data usually describes the sample, event, and site; each of these attribute types is described below.

The sample description may provide information on the sample itself: when and how it was collected, what it was analyzed for, the method and laboratory used to perform the analysis, and the result of the analysis. This section also can characterize the sample source, as well as the portion of a rain event that is represented by the sample.

The event information describes the discharge event itself. This includes when the rain started and stopped, when runoff started and ended, when the discharge to the receiving stream started and ended, and antecedent dry days.

Site description information spans a range of categories from geographic information and boundaries, such as coordinates, hydrologic sub-area, land use, and size of the watershed, to local data such as county, Caltrans district, and RWQCB district.

All original data documented on sample bottle identification labels, Chain of Custody forms, Sampling Activity Logs, and Inspection Checklists will be recorded using waterproof ink. These will be considered accountable documents. If an error is made on an accountable document, the individual will make corrections by lining through the error and entering the correct information. The erroneous information must not be obliterated. All corrections must be initialed and dated.

In addition to a paper copy of the water quality test results, the test results shall be submitted electronically in Microsoft Excel (.xls) format, and shall include, at a minimum, the following information from the laboratory: Sample ID Number, Contract Number, Constituent, Reported Value, Laboratory Name, Method Reference, Method Number, Method Detection Limit, and Reported Detection Limit. When possible, electronic data should be reported in a format consistent with the Caltrans' *Data-Reporting Protocols* (Caltrans, 2003c). Electronic copies of stormwater data shall be forwarded by e-mail to the RE.

Requirements for reporting discharges are detailed in Section 3.2.2 and include completing and submitting the Notice of Discharge Report form (CEM-2061). Completed Notice of Discharge reports must be submitted to the RE within 24 hours of a discharge event or discovery of evidence of a prior discharge. Copies of the Notice of Discharge reports must be kept in SWPPP file category 20.11 "Notice of Discharge Reports."

Reporting requirements for non-visible pollutants are detailed in Section 5.

Reporting requirements for NAL or Receiving Water Monitoring Trigger exceedances for non-stormwater discharges (Section 6), stormwater discharges (Section 7), ATS discharges (Appendix D), and receiving waters (Section 10) are detailed below.

11.2.1.1 Procedure for Reporting and Correcting NAL Exceedances

In the event that the daily average effluent measurement exceeds an applicable NAL:

1. Submit records (Numeric Action Level Exceedance Report, CEM-2062) to the RE within 48 hours per the contract specifications. The RE will electronically submit the storm event sampling results only (obtained from the NAL Exceedance Report) to SWRCB via SMARTS no later than 10 days after the conclusion of the storm event for Risk Level 2 projects and 5 days after the conclusion of the storm event for Risk Level 3 projects. RWQCB may also require the submittal of the NAL Exceedance Report upon review of the sampling results.

2. Assess the need for corrective actions. For example, determine whether the exceedance is due to run-on or a failed BMP. The WPC manager must inspect all BMPs to determine if any repairs are required. If the BMPs do not require repairs and the exceedance is not due to run-on, the WPC manager must redesign or implement new BMPs.

3. Implement corrective actions (if necessary), such as repairs or design changes, to BMPs.

4. After submitting the sampling results, RWQCB may request the NAL Exceedance Report. The RE, in turn, will submit the NAL Exceedance Report to RWQCB.

If RWQCB requires an NAL Exceedance Report, (CEM-2062), the report must be certified by the discharger in accordance with Section IV of the CGP and include:

- 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 must be reported as "less than the method detection limit").
- The date, place (sampling location), time of sampling, visual inspections results, and/or measurements, including rain gauge readings.
- A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions to correct the deficiency.
- Run-on monitoring results if there is reason to believe run-on may contribute to an exceedance of NALs.

11.2.1.2 Procedure for Reporting and Correcting Receiving Water Monitoring Trigger Exceedances

In the event that any effluent measurement exceeds an applicable Receiving Water Monitor Trigger (Risk Level 3 projects with direct discharge to receiving water only):

- The contractor must immediately notify the RE and submit results to the RE within six hours after a monitoring result is identified that exceeds any applicable Receiving Water Monitoring Trigger per the contract special provisions.
- The receiving waters must be subsequently sampled (upstream and downstream of outfall) for pH, turbidity, and any additional parameters for which monitoring is required by RWQCB.
- Subsequent effluent samples must be analyzed for SSC in addition to pH and turbidity if the turbidity daily average Receiving Water Monitoring Trigger is exceeded.

Compliance Storm Exemption. In the event that an applicable Receiving Water Monitoring Trigger is exceeded during a storm event equal to or larger than the 5-year,

24-hour storm, report the onsite rain gauge reading and nearby governmental rain gauge readings for verification.

The 5-year, 24-hour storm event verification must be done by reporting the onsite rain gauge readings, with verification from nearby governmental rain gauge readings.

11.3 Recordkeeping

All field measurements and laboratory analytical data must be kept in the SWPPP file. To manage the various documents required to by the SWPPP and to provide easy access to the documents, the following SWPPP file categories will be used to file SWPPP compliance documents:

File Category 20.01	Stormwater Pollution Prevention Plan (SWPPP)
File Category 20.02	Stormwater Pollution Prevention Plan Amendments
File Category 20.03	Water Pollution Control Schedule Updates
File Category 20.05	Notice of Construction or Notice of Intent
File Category 20.06	Legally Responsible Person Authorization of Approved Signatory
File Category 20.10	Correspondence
File Category 20.21	Subcontractor Contact Information and Notification Letters
File Category 20.22	Material Supplier Contact Information and Notification Letters
File Category 20.23	Contractor Personnel Training Documentation
File Category 20.31	Contractor Stormwater Site Inspection Reports
File Category 20.32	Caltrans Stormwater Site Inspection Reports
File Category 20.33	Site Visual Monitoring Inspection Reports
File Category 20.34	Best Management Practices Weekly Status Reports
File Category 20.35	Corrective Actions Summary
File Category 20.40	Weather Monitoring Logs
File Category 20.45	Storm/Rain Event Action, Sampling and Analysis Plans
File Category 20.50	Non-Stormwater Discharge Sampling and Test Results
File Category 20.51	Non-Visible Pollutant Sampling and Test Results
File Category 20.52	Turbidity, pH, and SSC Sampling and Test Results
File Category 20.53	Required Regional Water Board Monitoring Sampling and Test Results

File Category 20.54	ATS Monitoring Sampling and Test Result
File Category 20.55	Field Testing Equipment Maintenance and Calibration Records
File Category 20.61	Notice of Discharge Reports
File Category 20.62	Numeric Action Level Exceedance Reports
File Category 20.63	Numeric Effluent Limitation Violation Reports
File Category 20.70	Annual Certification of Compliance
File Category 20.80	Stormwater Annual Reports
File Category 20.90	Notice of Termination

The forms listed in Table 11-1 (as applicable) must be completed, maintained at the site with the SWPPP, and submitted to Caltrans per the contract specifications. The Caltrans stormwater forms are available at:
http://www.dot.ca.gov/hq/construc/forms.htm.

Retain all reports and records (including completed inspection forms) of all visual inspections and water quality monitoring for at least three years from the time Caltrans accepts the project. All records must be retained onsite with the SWPPP while construction is ongoing.

Table 11-1. Caltrans Stormwater Forms.

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2001	Form is obsolete and has been replaced with form CEM-2070. Form was used to certify compliance with Statewide NPDES Permit Order No. 92-08 DWQ, National Pollutant Discharge Elimination System (NPDES) No. CAS000002.			
CEM-2002	Notification of Construction form is obsolete and has been eliminated.			
CEM-2003	Form CEM-2003 is obsolete and has been replaced by form CEM-2090.			
CEM-2004	Notification of Construction (Desert Areas) form is obsolete and has been eliminated.			
CEM-2005	Rainfall Erosivity Waiver Notification form is obsolete and has been eliminated.			
CEM-2006	Legally Responsible Person Authorization of Approved Signatory	Form is used by the Legally Responsible Person (LRP) to authorize an Approved Signatory in accordance with provisions in Section IV.l of the Construction General Permit (CGP).	Completed by Caltrans, local agency, or private entity LRP. Include a copy of the completed form in the project SWPPP.	20.06
CEM-2006T	Legally Responsible Person Authorization of Approved Signatory – Lake Tahoe Hydrologic Unit	Form is used by the Legally Responsible Person (LRP) to authorize an Approved Signatory in accordance with Order No. R6T-2011-0019, NPDES No. CAG616002.	Completed by Caltrans, local agency, or private entity LRP. Include a copy of the completed form in the project SWPPP.	20.06
CEM-2008	SWPPP/WPCP Amendment Certification and Acceptance	Complete form for each SWPPP or WPCP amendment.	Must be used as the cover sheet for each amendment. Submit to the WPC manager and RE for review and approval (signature).	20.02

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2009	SWPPP/WPCP Amendments Log	Used to list all amendments to the SWPPP or WPCP.	Attach a completed copy of the form to each approved SWPPP/WPCP amendment, and include in SWPPP Attachment DD or WPCP Attachment C.	20.02 (original)
CEM-2023	Stormwater Training Record	Used to list all stormwater training conducted during the project. Use this form to document required weekly informal stormwater training.	Submit to the RE within five days of the date of training.	20.23
CEM-2024	Stormwater Training Log - Optional	Used to document training for employees responsible for activities associated with CGP compliance and contract specifications.	Submit updated copy to the RE within five days of the date of training.	20.23
CEM-2030	Stormwater Site Inspection Report	Used to document visual monitoring for storm-based monitoring (pre-storm, during storm, post-storm) and non-storm monitoring (quarterly non-stormwater, weekly Best Management Practices [BMP], and daily access roads).	Submit original to the RE within 24 hours of inspection.	Storm-based: 20.31 (copy) Non-storm-based: 20.33 (copy)

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2031	Daily Stormwater Site Inspection Report form is obsolete and has been eliminated.			
CEM-2034	Monthly Stormwater Best Management Practices & Materials Inventory Report	Used to provide a monthly list of stormwater BMPs from the stormwater pollution prevention plan that are active on the project site.	Submit original to the RE monthly.	20.34 (copy)
CEM-2035	Stormwater Corrective Actions Summary	Shall be completed for any deficiencies that were identified during visual monitoring (site inspection) and for corrections of deficiencies.	Submit to the RE when corrections are completed but must be submitted within five days of the site inspection.	20.35 (original)
CEM-2040	Weather Forecast Monitoring form is obsolete and has been eliminated.			
CEM-2041	Weather Monitoring form is obsolete and has been eliminated.			

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2045	Rain Event Action Plan	Must be completed for Risk Level 2 and Risk Level 3 projects with the chance for precipitation 50 percent, or greater, within 72 hours of the forecast date. The Rain Event Action Plan (REAP) must be developed 48 hours prior to any likely precipitation rain event (any weather pattern that is forecast to have a 50 percent, or greater, probability of producing precipitation in the project area).	Within 24 hours prior to a storm event, the REAP must be submitted to the RE. The REAP must be made available on site and implementation begun no later than 24 hours prior to the likely precipitation event.	20.45
CEM-2045T	Rain Event Action Plan – Lake Tahoe Hydrologic Unit	Must be completed for projects in the Lake Tahoe Hydrologic Unit with the chance for precipitation 30 percent, or greater, within 48 hours of the forecast date. The Rain Event Action Plan (REAP) must be developed no later than 24 hours before any anticipated precipitation rain event (any weather pattern that is forecast to have a 30 percent, or greater, probability of producing precipitation in the project area).	Within 24 hours before a storm event, the REAP must be submitted to the RE. The REAP must be made available onsite and implementation begun no later than 24 hours before the anticipated precipitation event.	20.45
CEM-2046	Rain Event Action Plan Plant Establishment Phase form is obsolete and has been eliminated.			
CEM-2047	Rain Event Action Plan Inactive Project form is obsolete and has been eliminated.			

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2048	Storm Event Sampling and Analysis Plan form is obsolete and has been eliminated.			
CEM-2049	Qualifying Rain Event Sampling and Analysis Plan form is obsolete and has been eliminated.			
CEM-2049T	Qualifying Rain Event Sampling and Analysis Plan – Lake Tahoe Hydrologic Unit form is obsolete and has been eliminated.			
CEM-2050	Sample Information, Identification, and Chain of Custody Record form is obsolete and has been eliminated.			
CEM-2051	Stormwater Sampling and Testing Activity Log – Optional Form	Optional form used to document details of all sampling events and to record results for the samples collected.	Form is an optional management tool to be used at the discretion of the WPC manager.	20.50, 20.51, 20.52, 20.53, or 20.54 (copy)
CEM-2052	Stormwater Sample Field Test Report	Required to be completed for each sample or set of samples.	Submit to the RE with form CEM-2051 within 48 hours of sampling.	20.50, 20.51, 20.52, 20.53, or 20.54 (copy)
CEM-2054	Stormwater Sample Laboratory Test Report form is obsolete and has been eliminated.			

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2055	Stormwater Equipment Maintenance Log form is obsolete and has been eliminated.			
CEM-2056	Stormwater Turbidity Meter Calibration Record form is obsolete and has been eliminated. Turbidity meter calibration is now recorded on form CEM-2052 Stormwater Sample Field Test Report.			
CEM-2057	Stormwater pH Meter Calibration Record form is obsolete and has been eliminated. pH meter calibration is now recorded on form CEM-2052 Stormwater Sample Field Test Report.			
CEM-2058	Stormwater Meter Calibration Record - Specialty Meters	Used to document calibration of other meters (e.g., dissolved oxygen, conductivity). Must be conducted at least one time per year or per the manufacturer's recommendations.	Submit to WPC manager for review and approval (signature).	20.55 (original)
CEM-2061	Notice of Discharge Report	To be completed when discharges are causing or contributing to an exceedance of an applicable water quality standard.	Discharges reported to the RE verbally when discovered. Submit original form to the RE within 24 hours of discovery.	20.61 (copy)

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2062	Numeric Action Level Exceedance Report	Complete if the daily average of effluent sample analysis results exceeds an applicable numeric action level (NAL).	Submit original form to the RE within 48 hours. The RE will electronically sampling results to the SWRCB via Storm Water Multi-Application and Report Tracking System (SMARTS) within 10 after the conclusion of the storm event. RWQCB also may require the submittal of the NAL Exceedance Report upon review of the sampling results.	20.62 (copy)
CEM-2062T	NAL Exceedance Report– Lake Tahoe Hydrologic Unit form is obsolete and has been eliminated.			
CEM-2063	Numeric Effluent Limitation Violation Report – ATS Discharges	For sites with ATS only, complete if the daily average or maximum of effluent sample analysis results exceeds an applicable numeric effluent limitation (NEL).	Immediately report to the RE verbally. Submit original form to the RE within six hours after violation is identified. The RE will electronically submit an NEL Violation Report to the SWRCB via SMARTS within 24 hours after the NEL exceedance has been identified.	20.63 (copy)

Table 11-1. (Continued)

Form Number	Form Title	Description	Submittal Requirements	SWPPP File Category
CEM-2063T	Numeric Effluent Limitation Violation Report – Lake Tahoe Hydrologic Unit	Complete if the daily average of effluent sample analysis results exceeds an applicable numeric effluent limitation (NEL).	Immediately report to the RE verbally. Submit original form to the RE within six hours after violation is identified. The RE will orally notify the Lahontan Water Board within 24 hours after the NEL exceedance has been identified and electronically submit storm event sampling results via SMARTS within five days after the NEL exceedance has been identified.	20.63 (copy)
CEM-2065	Notice of Discharge Log form is obsolete and has been eliminated.			
CEM-2070	SWPPP/WPCP Annual Certification of Compliance	Annual Certification of Compliance is required by July 15 of each year. The Annual Report consists of CEM-2070 and all file category items for the fiscal year to be submitted by the RE to RWQCB by September 1 of each year for all projects that are enrolled for more than one continuous three-month period.	Submit to the RE by July 15.	20.70 (copy)
CEM-2075	Project Stormwater Annual Report	Annual report is required to be submitted by the Water Pollution Control Manager to the Resident Engineer by July 15 of each year.	Submit to the RE by July 15.	20.80 (copy)
CEM-2090	Notice of Completion of Construction	The Caltrans Statewide NPDES Stormwater Permit Order No. 99-06 DWQ, NPDES No. CAS000003 requires that Caltrans submit a Notice of Completion of Construction for construction projects that have been completed.	Typically completed by Caltrans staff.	20.90

12 FURTHER ASSISTANCE

California Department of Transportation
Environmental Program
http://www.dot.ca.gov/hq/env/index.htm

Storm Water Management Program
http://www.dot.ca.gov/hq/env/stormwater/

Department NPDES Permit
http://www.swrcb.ca.gov/water_issues/programs/stormwater/caltrans_permits.shtml

Storm Water Quality Handbooks
http://www.dot.ca.gov/hq/construc/stormwater/

Table 12-1. Regional Water Quality Control Boards.

Regional Water Quality Control Board	Address	Contact E-mail/Website	Telephone/Fax
North Coast Region (1)	5550 Skylane Blvd., Suite A Santa Rosa, CA 95403	www.waterboards.ca.gov/northcoast E-mail: Info1@waterboards.ca.gov	(707) 576-2220 FAX: (707) 523-0135
San Francisco Bay Region (2)	1515 Clay St., Suite 1400 Oakland, CA 94612	www.waterboards.ca.gov/sanfranciscobay E-mail: Info2@waterboards.ca.gov	(510) 622-2300 FAX: (510) 622-2460
Central Coast Region (3)	895 Aerovista Place, Suite 101 San Luis Obispo, CA 93401	www.waterboards.ca.gov/centralcoast E-mail: Info3@waterboards.ca.gov	(805) 549-3147 FAX: (805) 543-0397
Los Angeles Region (4)	320 W. 4th St., Suite 200 Los Angeles, CA 90013	www.waterboards.ca.gov/losangeles E-mail: Info4@waterboards.ca.gov	(213) 576-6600 FAX: (213) 576-6640
Central Valley Region (5s) Sacramento Office	11020 Sun Center Drive, Suite 200 Rancho Cordova, CA 95670-6114	www.waterboards.ca.gov/centralvalley E-mail: Info5@waterboards.ca.gov	(916) 464-3291 FAX: (916) 464-4645
Central Valley Region (5f) Fresno Branch Office	1685 E Street, Suite 200 Fresno, CA 93706	www.waterboards.ca.gov/centralvalley E-mail: Info5@waterboards.ca.gov	(559) 445-5116 FAX: (559) 445-5910
Central Valley Region (5r) Redding Branch Office	415 Knollcrest Dr. Redding, CA 96002	www.waterboards.ca.gov/centralvalley E-mail: Info5@waterboards.ca.gov	(530) 224-4845 FAX: (530) 224-4857

Regional Water Quality Control Board	Address	Contact E-mail/Website	Telephone/Fax
Lahontan Region (6slt) South Lake Tahoe Office	2501 Lake Tahoe Blvd. South Lake Tahoe, CA 96150	www.waterboards.ca.gov/lahontan E-mail: Info6@waterboards.ca.gov	(530) 542-5400 FAX: (530) 544-2271
Lahontan Region (6v) Victorville Office	14440 Civic Dr., Suite 200 Victorville, CA 92392	www.waterboards.ca.gov/lahontan E-mail: Info6@waterboards.ca.gov	(760) 241-6583 FAX: (760) 241-7308
Colorado River Basin Region (7)	73-720 Fred Waring Dr., Suite 100 Palm Desert, CA 92260	www.waterboards.ca.gov/coloradoriver E-mail: Info7@waterboards.ca.gov	(760) 346-7491 FAX: (760) 341-6820
Santa Ana Region (8)	3737 Main St., Suite 500 Riverside, CA 92501-3339	www.waterboards.ca.gov/santaana E-mail: Info8@waterboards.ca.gov	(951) 782-4130 FAX: (951) 781-6288
San Diego Region (9)	9174 Sky Park Court, Suite 100 San Diego, CA 92123	www.waterboards.ca.gov/sandiego E-mail: Info9@waterboards.ca.gov	(858) 467-2952 FAX: (858) 571-6972

State Water Resources Control Board

Division of Water Quality
Storm Water Permit Section
P.O. Box 1977
Sacramento, CA 95812-1977
Construction Inquiry Line: (916) 341-5537
Web Site: http://www.waterboards.ca.gov/water_issues/programs/stormwater/
E-mail: stormwater@waterboards.ca.gov

General Construction Permit

http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

How to Obtain a List of State-Certified Laboratories

http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx

Other Useful Websites

California Stormwater Quality Association
http://www.casqa.org/

13 GLOSSARY

ATS	active treatment system
Benthic Macroinvertebrate Bioassessment	required for projects disturbing 30 acres or more with direct discharge to a freshwater wadeable stream that is either: (a) listed by the SWRCB or United States Environmental Protection Agency as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or has the designated beneficial uses SPAWN & COLD & MIGRATORY. (Guidance on bioassessment monitoring is not included in this manual.)
BMP	best management practice
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CFR	Code of Federal Regulations
CGP	Construction General Permit
CSMP	Construction Site Monitoring Program
CWA	Clean Water Act
DHS	Department of Health Services
EDD	electronic data delivery
EPA	United States Environmental Protection Agency
ID	identification
MS/MSD	matrix spike/matrix spike duplicate. An environmental sample spiked with known concentrations of target analytes that is used to evaluate the accuracy and precision of the laboratory extraction and analysis procedures.
MS4	Municipal Separate Storm Sewer System. An MS4 is a conveyance or system of conveyances that is: • Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.; • Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.); • Not a combined sewer; and

- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

NAL	numeric action level
NEL	numeric effluent limitation
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometer turbidity unit
NWS	National Weather Service
PAH	polycyclic aromatic hydrocarbons
PPDG	Project Planning and Design Guide
QA	quality assurance
QAPrP	Quality Assurance Project Plan
QC	quality control
QPF	quantitative precipitation forecast
QSD	Qualified SWPPP Developer
QSP	Qualified SWPPP Practitioner
qualifying rain event	any event producing precipitation of 0.5 inch or greater over the duration of the rain event
RE	Resident Engineer
REAP	Rain Event Action Plan
RL	reporting limit. Minimum value that can be reported with confidence for any given parameter as established by a specific laboratory.
RPD	relative percent difference
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SMARTS	Stormwater Multi-Application and Report Tracking System
SSC	suspended sediment concentration
SSP	Standard Special Provisions
SWAMP	Surface Water Ambient Monitoring Program
SWPPP	Storm Water Pollution Prevention Plan
SWQTF	Storm Water Quality Task Force
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load

VOC	volatile organic compound
WDR	waste discharge requirement
WPCD	Water Pollution Control Drawings
WPC	Water Pollution Control
WPCP	Water Pollution Control Program
WQO	water quality objective

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14 REFERENCES

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APPENDIX A

FORMS INSTRUCTIONS

APPENDIX A – FORMS INSTRUCTIONS

This section describes how to complete the Caltrans forms required for compliance with the CGP, the Caltrans Stormwater Permit, and contract specifications. These forms (as applicable) must be completed, maintained at the site with the SWPPP, and submitted to Caltrans per the contract special provisions. These forms are available on the Caltrans website at:

http://www.dot.ca.gov/hq/construc/stormwater/inspection.html.

Instructions on completing the following forms are provided below:

- CEM-2023 Stormwater Training Record
- CEM-2024 Stormwater Training Log - Optional
- CEM-2030 Stormwater Site Inspection Report
- CEM-2034 Monthly Stormwater Best Management Practices & Materials Inventory Report
- CEM-2035 Stormwater Corrective Actions Summary
- CEM-2045 Rain Event Action Plan
- CEM-2045T Rain Event Action Plan – Lake Tahoe Hydrologic Unit
- CEM-2051 Stormwater Sampling and Analysis Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report
- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters
- CEM-2061 Notice of Discharge Report
- CEM-2062 Numeric Action Level Exceedance Report
- CEM-2063 Numeric Effluent Limitation Violation Report – ATS Discharges
- CEM-2063T Numeric Effluent Limitation Violation Report – Lake Tahoe Hydrologic Unit

A.1 General Project Title Block Form Instructions

Contract Number/Co/Rte/PM

For local agency encroachment permit projects, write the encroachment permit number in the Contract Number field.

Project Identifier Number

Caltrans projects starting on or after July 1, 2010, will have a Project Identifier Number. For projects without a Project Identifier Number, enter "N/A" in the field.

WDID Number

The WDID number is the number that the SWRCB gives each permittee when the permittee applies for an NOI under the CGP. For projects with a Water Pollution Control Program (WPCP), enter "WPCP" in this field.

Project Site Risk Level

The CGP requires construction activity that results in soil disturbance of 1 acre or more to be permitted under the CGP and have a fully developed site SWPPP. Construction projects with a disturbed soil area of less than one acre do not require coverage under the CGP; however, Caltrans requires that a WPCP be prepared. For projects with a WPCP, check "WPCP," if applicable to the form. For a project in the Lake Tahoe Hydrologic Unit, check "N/A."

For projects with SWPPPs, check the project's Risk Level. The CGP establishes three levels of possible risk for a construction site (Risk Level 1, 2, or 3). The CGP regulatory requirements vary depending on the risk level of the project. The project's Risk Level is specified in the contract special provisions.

A.2 CEM-2023 Stormwater Training Record

General Information:

This form is used to document each stormwater training (formal and informal) conducted for contractor and subcontractor managers, supervisors, and employees during the project. A new form must be completed for each stormwater training conducted. The form details which individuals have attended the training and topics covered. CEM-2024 Stormwater Training Log – Optional also can be updated when new training is conducted. See Section 4.3 for stormwater training requirements.

Stormwater training includes CGP-required specific training or certifications for key personnel (SWPPP preparers, inspectors, etc.) to ensure that their level of knowledge and skills are adequate to capably design and evaluate project specifications in compliance with CGP requirements. Formal stormwater training includes QSD, QSP, Caltrans-approved 24-hour stormwater management training, and ATS operator training.

This form also documents informal stormwater training. For Caltrans QA/QC purposes, all training project managers, supervisory personnel, subconsultants, and employees involved in WPC work must be trained in stormwater BMP implementation and maintenance standards. This training includes WPC rules and regulations that provide guidelines in sediment and erosion control standards, spill prevention, identifying and handling hazardous substances, proper construction waste management, construction site monitoring, and stormwater quality sampling and analysis. WPC training must be completed prior to working on the job and be conducted weekly thereafter.

Submittal/Filing Requirements:

Provide this training record and an updated copy of CEM-2024, Stormwater Training Log – Optional (CEM-2024 is an optional form used at the WPC manager's discretion), to the RE within five days of the date of training. File a copy of the form in SWPPP File Category 20.23. Include the form and required training documentation in the stormwater annual report.

Form Information:

Title Block

See Section A.1 for information on completing general project information section.

Stormwater Training Record

Complete form as indicated on form.

Training Audience

Check one of the following responses:

General—Training for individuals responsible for activities associated with compliance with the Construction General Permit (e.g., QSP, personnel supervised by QSP).

BMPs—Training for individuals responsible for BMP installation, inspection, maintenance, and repair (e.g., QSP, personnel supervised by QSP).

SWPPP—Training for individuals responsible for overseeing, revising, and amending the SWPPP (e.g., QSD, WPC manager).

Attendee Roster

Enter employee name and employee's company name. Employee must initial in the center column.

Review and Record Keeping (CEM-2023, Page 2)

The WPC manager must review and sign the form.

A.3 CEM-2024 Stormwater Training Log – Optional

General Information:

This form is an optional form used at the WPC manager's discretion. The form logs all stormwater training conducted for contractor and subcontractor managers, supervisors, and employees. The form provides a summary or running log of all training conducted for the project. See general information for form CEM-2023 for types of stormwater training required by the CGP and Caltrans.

Submittal/Filing Requirements:

Provide an updated copy of this form with attached training documentation to the RE within five days of the date of training. File a copy of the form in SWPPP File Category 20.23. Include the form and required training documentation in the stormwater annual report.

Form Information:

See instructions for form CEM-2023.

A.4 CEM-2030 Stormwater Site Inspection Report

General Information:

This form documents stormwater inspections conducted to comply with the CGP. Inspections that must be documented on this form are:

- Weekly BMP Inspections
- Quarterly Non-Stormwater Inspections
- Pre-Storm, During Storm, and Post-Storm Inspections

See Section 3 for information on what is required for each inspection.

Submittal/Filing Requirements:

Submit the original from to the RE within 24 hours of inspection. File a copy of the form conducted for pre-storm, during storm, and post-storm inspections in SWPPP File Category 20.31. File a copy of the form conducted for weekly BMP and quarterly inspections in SWPPP File Category 20.33.

Form Information:

If the inspection form does not contain enough lines to report all job site locations or issues, use Add Item so that all inspected locations are reported.

Title Block

See Section A.1 for information on completing general project information section.

Inspection Type (CEM-2030, Page 1)

Check one of the inspections types. See Section 3 for description of each inspection type. Complete Storm Information for the selected inspections type located on the same row.

Storm Information (CEM-2030, Page 1)

Complete the storm information for the selected inspection type. Weather information should be the best estimate of beginning of the storm event, duration of the event, and time elapsed since the last storm. A rain event is considered to have ended when no measurable precipitation is recorded within a consecutive 48-hour period. For completing pre-storm information, see Section 4.4.1 for information on weather tracking. Obtain forecasted precipitation information from the NWS Forecast Office website, http://www.srh.noaa.gov/forecast.

Rainfall amounts should be recorded from the project site rain gauge. See Section 4.5 for further information on rain gauge readings.

Site Inspection of Best Management Practices (CEM-2030, Pages 2-3)

Project BMPs must be inspected daily during some activities (see Section 3.2.1), during weekly BMP inspections, and during pre-storm, during storm, and post-storm inspections. See Section 3.2.3 for additional information on inspecting BMPs.

If BMP failures or shortcomings are identified during the inspection, repairs or design changes to BMPs, as directed by the WPC manager, must be completed as within 24 hours of identification, unless a longer period is authorized as per Caltrans Standard

Specifications 13-1.03A. All corrective actions reported on this form also must be reported on form CEM-2035, Stormwater Corrective Actions Summary. See Section 3.2.3 for additional information on identifying corrective measures.

Answer questions by clicking on box next to either Yes or No. The form is automated and will expand with additional questions if necessary.

Site Inspection Report General Comments (CEM-2030, Page 4)

Review the SWPPP and corrective actions identified during the inspection(s) to answer the questions.

Stormwater Inspection Report Certification (CEM-2030, Page 5)

The individual conducting the stormwater inspection and the WPC manager must sign and date the form.

Stormwater Inspection Report Acceptance (CEM-2030, Page 5)

The RE must sign and date the form.

A.5 CEM-2034 Monthly Stormwater Best Management Practices & Materials Inventory Report

General Information:

This form is used to provide a monthly list of stormwater BMPs from the SWPPP that are active or that will be active on the project site each week of the month.

Submittal/Filing Requirements:

The WPC manager must oversee preparation of the monthly report and submit the original from to the RE monthly. File a copy of the form in SWPPP File Category 20.34.

Form Information:

See Section A.1 for information on completing general project information section.

Attach additional copies of page 2 and page 3 of this form to include all required locations. Insert consecutive numbers for each location when using page 2 or page 3 of this form.

Identify the locations of project BMPs.

Identify area of disturbed soil in acres. Identify how many acres are active and inactive disturbed soil areas. Inactive areas are those with disturbed soil and are not scheduled to be re-disturbed for at least 14 days.

List the name and ID of all BMPs used at that location. BMP IDs are provided on page 4 of the form.

Identify the quantity on hand and the estimated quantity needed if the rain event predicted spill occurs or BMP fails.

Repeat for all project locations where BMPs are installed.

A.6 CEM-2035 Stormwater Corrective Actions Summary

General Information:

This form must be completed for any deficiencies that were identified during visual monitoring (site inspection) and for corrections of deficiencies.

Submittal/Filing Requirements:

A copy must be attached to corresponding inspection report (form CEM-2030). The form must be submitted to the RE when corrections are completed but must be submitted within five days of the site inspection. File the original of the form in SWPPP File Category 20.35. File a copy of the form with the corresponding inspection report (CEM-2030) in SWPPP File Category 20.31 or 20.33.

Form Information:

See Section A.1 for information on completing general project information section.

If the summary form does not have enough lines to report all required actions, use Add Page or use additional copies of page 2 from this form to report all required corrective actions from an inspection form.

On page 2 of this form (and on additional copies of page 2, if applicable), insert consecutive numbers for each required corrective action.

If BMP failures or shortcomings are identified during the inspection, any repairs or design changes to BMPs, as directed by the WPC manager, must be completed within 24 hours of identification, unless a longer period is authorized as per Caltrans Standard Specifications 13-1.03A. All corrective actions must be reported on this form. See

Section 3.3.2 for additional information on identifying corrective measures. Comments must be provided when the required action is changed from the Stormwater Site Inspection Report.

Certification and Review (CEM-2035, Page 2)

The WPC manager and RE must review, sign, and date the completed form.

A.7 CEM-2045 Rain Event Action Plan

General Information:

This form must be completed by the WPC manager for Risk Level 2 and Risk Level 3 projects in the highway construction phase when the chance for precipitation is 50 percent or greater within 72 hours of the forecast date. The Rain Event Action Plan (REAP) must be developed 48 hours prior to any likely precipitation rain event (any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the project area). A REAP is designed to protect exposed areas of the project within 48 hours prior to a likely precipitation event. The REAP must be made available on site and implementation begun no later than 24 hours prior to the likely precipitation event.

Submittal/Filing Requirements:

This form must be submitted to the RE within 24 hours prior to a storm event. File the original of the form in SWPPP File Category 20.45.

Form Information:

Title Block

See Section A.1 for information on completing general project information section.

Enter the contact information for the WPC manager, erosion and sediment control provider or subcontractor, and the stormwater sampling and testing agent or subcontractor.

Storm Information (CEM-2045, Page 1)

Enter the project site zip code.

Enter the date and time the forecast was checked.

Obtain weather forecast information for the project site on the NWS Forecast Office website:
http://www.srh.noaa.gov/forecast

1. On NWS website, enter the site's nearest city, state, or zip code in the "Search for" box.

2. Click on "Forecast Weather Table Interface" on the bottom right side of the page.

3. Enter weather forecast information from the Forecast Weather Table. Record forecasted chance of precipitation and precipitation amounts for each six-hour period for the next 24 hours, 48 hours, and 72 hours. For each day a forecast is recorded, do not include forecast information for the current date.

4. If the predicted weather pattern is forecasted to produce one-half inch or more of rain, check the "Yes" box. Otherwise, check the "No" box.

Phase Information (CEM-2045, Page 1)

Enter the phase the construction is in.

Sampling Schedule (CEM-2045, Page 1)

When non-visible pollutant sampling is required (see Section 5), (a) grab sample(s) must be collected during the first two hours of discharge occurring during project working hours from all discharge locations that meet the non-visible pollutant sampling criteria and that can be safely accessed. Based on the weather forecast, enter the date and time that stormwater discharge sampling is required to begin. Stormwater discharge sampling is required every 24 hours during an extended storm event. Based on the predicted duration of the storm event, enter the dates sampling is required.

Sampling Locations for Storm Event Listed in Numeric Order (CEM-2045, Page 2)

Enter the order in which the stormwater discharge sample location(s) will be sampled.

CEM-2045, Page 2

Check all boxes that apply to current project site activities, subcontractors, and trade information provided.

Predicted Rain-Event-Triggered Actions (CEM-2045, Pages 3-6)

Check all boxes that apply to current project site.

Certification of Rain Event Action Plan (CEM-2045, Page 7)

The WPC manager and RE must sign and date the completed form.

A.8 CEM-2045T Rain Event Action Plan – Lake Tahoe Hydrologic Unit

General Information:

This form must be completed by the WPC manager for projects that reside in the Lake Tahoe Hydrologic Unit and are regulated under Order No. R6T-2011-0019, NPDES No. CAG616002 when the chance for precipitation is 30 percent, or greater, within 48 hours of the forecast date. The REAP must be developed no later than 24 hours before any anticipated precipitation rain event (any weather pattern that is forecast to have a 30 percent, or greater, probability of producing precipitation in the project area). During periods when thunderstorm activity is anticipated, the weather conditions must be monitored during the course of the day, and a REAP prepared and implemented if the chance of thunderstorms becomes 30 percent, or greater, or when visual observations indicate imminent precipitation. A REAP is designed to protect exposed areas of the project within 24 hours before a likely precipitation event. The REAP must be made available onsite and implementation begun no later than 24 hours before the anticipated precipitation event. The REAP must be checked and updated daily for storms expected to last over a period of several days. The REAP must be developed for all phases of construction until the permit coverage is terminated by the Lahontan Water Board.

Submittal/Filing Requirements:

This form must be submitted to the RE within 24 hours before a storm event. File the original of the form in SWPPP File Category 20.45. A printed copy of precipitation forecast information from the NWS Forecast Office for each day of construction operations must be kept with the SWPPP monitoring records. Obtain forecasted precipitation information from the NWS Forecast Office website, http://www.srh.noaa.gov/forecast.

Form Information:

See instructions for form CEM-2045 for information on completing the form.

A.9 CEM-2051 Stormwater Sampling and Analysis Log – Optional Form

General Information:

This form is an optional management tool that is to be used at the discretion of the WPC manager. This form can be used to document details of all sampling events and to record results for the samples collected. Complete this form for every storm event that requires sampling and analysis. Complete this form weekly for logging non-stormwater sampling and analysis, and indicate in the sampling location column the reason for non-stormwater samples (e.g., sample from dewatering operation).

Submittal/Filing Requirements:

Submit to the RE with form CEM-2052 within 48 hours of sampling for field analyzed samples, and within 30 days of collection for laboratory analyses. File a copy of this form in SWPPP File Category 20.50, 20.51, 20.52, 20.53, or 20.54, as appropriate.

Form Information:

Title Block (CEM-2051, Page 1)

See Section A.1 for information on completing general project information section.

Stormwater Sampling and Analysis Log Review (CEM-2051, Page 1)

The WPC manager must review, sign, and date the completed form.

Stormwater Sampling and Analysis Log (CEM-2051, Page 2)

Complete the table for all samples collected on the sample date. Include sample result units with sample result (e.g., 29 NTU for turbidity or 275 mg/L for TSS). See Section 4.12.1 for more information on calculating daily average.

A.10 CEM-2052 Stormwater Sample Field Test Report

General Information:

Complete this form for each sample or set of samples that are tested in the field (as opposed to analyzed by a laboratory).

Submittal/Filing Requirements:

Submit to the RE with form CEM-2051 within 48 hours of sampling. File a copy of this form in SWPPP File Category 20.50, 20.51, 20.52, 20.53, or 20.54.

Form Information:

Title Block (CEM-2052, Page 1)

See Section A.1 for information on completing general project information section.

Stormwater Samples Analysis (CEM-2052, Page 1)

Enter the sampling location (e.g., site discharge location near Interstate 5), date of sampling, and sample location identification number (see Section 4.4.3). The person who analyzes the sample must sign and print their name, phone number, and company (e.g., Caltrans). Enter the parameters that the sample should be analyzed for. "Other" field parameters could include those required by RWQCB (see Section 6).

Stormwater Samples Analysis Results (CEM-2052, Pages 1-2)

Enter the sample identification number and testing results. See Section 4.12.1 for more information on calculating daily average.

Turbidity, pH, and Other Analysis Information (CEM-2052, Page 2)

Enter meter information. Information may be obtained from the meter instruction manual(s) available in the SWPPP files.

Turbidity Calibration Record (CEM-2052, Page 2)

Enter the standard solutions used in the calibration. For example, the Hach 2100Q turbidity meter calibration is accomplished with three standards (20 NTU, 100 NTU, and 800 NTU) provided in the meter kit by the manufacturer.

Enter the calibration standard solution expiration date that is printed on the calibration standard bottle.

Record the time of calibration. Record each calibration reading. If the meter does not calibrate within acceptable limits, recalibrate the meter and record the recalibration readings.

A drift check is used determine the ability of the meter to retain calibration over extended field use. A drift check would be performed at the end of day by measuring the change in reading to one or more standard solutions. The default acceptable performance is 10 percent.

Record any notes regarding calibration. Any corrective actions to calibrate the meter or maintenance activities must be noted. The person who calibrates the meter must initial the calibration performed for each standard solution.

pH Calibration Record (CEM-2052, Page 2)

Enter the date of calibration. Enter the electrode number written on the meter. Record the temperature at the time of calibration (often the pH meter will read temperature also). Enter the calibration slope that the meter will calculate at the end of calibration. Check which buffers were used for calibration. At least two buffers must be used for calibration. A three-buffer calibration is preferable. If a two buffer calibration is used, the pH 7.0 and pH 10.0 buffer solutions should be used since Caltrans projects will often use high pH materials such as cement.

After calibration, the meter can be checked by recording the meter reading for the pH 7.0 buffer solution. The default acceptable performance is 10 percent.

The person calibrating the meter must initial that the calibration was performed as recorded.

Review and Recordkeeping (CEM-2052, Page 2)

Check the corresponding “Yes” or “No” box if test results were entered into the sampling and testing activity log (CEM-2051).

Check the corresponding “Yes” or “No” box if the NAL was exceeded.

Check the corresponding “Yes” or “No” box if the NEL or Receiving Water Monitoring Trigger was exceeded.

See Table 4-2 for NALs and Receiving Water Monitoring Triggers, and Table D-2 for NELs. See Section 11.2 for requirements if an NAL or Receiving Water Monitoring Trigger is exceeded.

Review and Recordkeeping (CEM-2052, Page 2)

The WPC manager and RE must review, sign, and date the completed form.

A.11 CEM-2058 Stormwater Meter Calibration Record – Specialty Meters

See instructions for CEM-2052.

A.12 CEM-2061 Notice of Discharge Report

General Information:

This form is to be completed when the contractor, Caltrans, State Water Resources Control Board (SWRCB), or RWQCB staff determines that stormwater discharges, authorized non-stormwater discharges, or non-authorized, non-stormwater discharges are causing or contributing to an exceedance of an applicable water quality standard. Water quality standards are contained in the Statewide Water Quality Control Plan or applicable RWQCBs Basin Plan. See Table 10-1 for RWQCB Basin Plans Online Resources.

Submittal/Filing Requirements:

Discharges must be reported to the RE verbally when discovered. Submit the original form to the RE within 24 hours of discovery. File a copy of this form in SWPPP File Category 20.61.

Form Information:

Title Block (CEM-2061, Page 1)

See Section A.1 for information on completing general project information section.

Notice of Discharge General Information (CEM-2061, Page 1)

See form instructions on page 4.

Storm Event Information (CEM-2061, Page 1)

See instructions for forms CEM-2030.

Notice of Discharge Information (CEM-2061, Pages 1-2)

Complete section as indicated on form.

Sampling and Analysis Results (CEM-2061, Page 2)

See instructions for forms CEM-2052.

Analysis Information (CEM-2061, Page 2)

See instructions for form CEM-2052.

Sampling and Analysis Results (CEM-2061, Page 3)

Complete section as indicated on form.

Notice of Discharge Report Certification (CEM-2061, Page 3)

The WPC manager and RE must review, sign, and date the completed form.

A.13 CEM-2062 Numeric Action Level Exceedance Report

General Information:

For Risk Level 2 or 3 projects, complete this form if the daily average of effluent sample analysis results exceeds an applicable NAL. See Section 11.2 for additional information on NAL reporting. See Table 4-2 for NALs. See Section 4.12.1 for information on calculating daily average.

Submittal/Filing Requirements:

Submit original form to the RE within 48 hours. The RE will electronically submit sampling results to the SWRCB via Storm Water Multi-Application and Report Tracking System (SMARTS) within 10 days after the conclusion of the storm event5. The RE will submit the NAL Exceedance Report if required by the RWQCB upon review of the sampling results.

File a copy of this form in SWPPP File Category 20.62.

Form Information:

Title Block (CEM-2062, Page 1)

See Section A.1 for information on completing general project information section.

Numeric Action Level Exceedance Information (CEM-2062, Page 2)

See instructions for form CEM-2052.

Analysis Information (CEM-2062, Page 2)

Complete section as indicated on form.

Storm Event Information (CEM-2062, Page 2)

See instructions for form CEM-2030.

Exceedance Location Information (CEM-2062, Page 2)

Complete section as indicated on form.

Additional Information (CEM-2062, Page 3)

Complete section as indicated on form.

Numeric Action Level Exceedance Report Certification (CEM-2062, Page 4)

The WPC manager and RE must review, sign, and date the completed form.

Notice of Discharge Reporting (CEM-2062, Page 4)

Complete section as indicated. The RE must review and initial.

A.14 CEM-2063 Numeric Effluent Limitation Violation Report – ATS Discharges

General Information:

For ATS projects, complete this form if the daily average or maximum of effluent sample analysis results exceeds an applicable NEL. See Section 11.2 for additional information on NEL reporting. See Table D-2 for NELs. See Section 4.12.1 for information on calculating daily average.

Submittal/Filing Requirements:

If an NEL is exceeded, immediately report the results to the RE verbally. Submit the original NEL Violation Report form to the RE within six hours after a violation is identified. The RE will electronically submit an NEL Violation Report to the SWRCB via SMARTS within 24 hours after the NEL exceedance has been identified. File a copy of this form in SWPPP File Category 20.63.

Form Information:

See instructions for CEM-2062.

A.15 CEM-2063T Numeric Effluent Limitation Violation Report – Lake Tahoe Hydrologic Unit

General Information:

For projects that reside in the Lake Tahoe Hydrologic Unit and are regulated under Order No. R6T-2011-0019, NPDES No. CAG616002, complete this form if the daily average of effluent sample analysis results exceeds an applicable NEL. See Section 4.12.1 for information on calculating daily average.

Submittal/Filing Requirements:

If an NEL is exceeded, immediately report the results to the RE verbally. Submit the original NEL Violation Report form to the RE within six hours after a violation is identified. The RE must orally notify the Lahontan Water Board within 24 hours after the NEL exceedance has been identified and electronically submit the storm event sampling results via SMARTS within five days after the NEL exceedance has been identified. File a copy of this form in SWPPP File Category 20.63.

Form Information:

See instructions for CEM-2063.

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APPENDIX B

BOTTLE AND EQUIPMENT CLEANING PROTOCOLS

APPENDIX B BOTTLE AND EQUIPMENT CLEANING PROTOCOLS

B.1 Sample Bottles

1. Rinse bottle with warm tap water three times as soon as possible after emptying sample.
2. Soak in a 2 percent phosphate-free laboratory-grade soap solution for 48 hours; scrub with clean plastic brush.
3. Rinse three times with tap water.
4. Rinse five times with deionized water, rotating the bottle to ensure contact with the entire inside surface.
5. Rinse three times with hexane, rotating the bottle to ensure contact with the entire inside surface (use 30 milliliter [mL] per rinse).
6. Rinse six times with deionized water.
7. Rinse three times with 2N nitric acid (1 liter per bottle, per rinse) rotating the bottle to ensure contact with the entire inside surface.
8. Rinse six times with deionized water.
9. Cap bottle with Teflon lined lid cleaned as specified below.

B.2 Lids

1. Make up a 2 percent solution of Micro-Soap in warm tap water.
2. Rinse tubing three times with the 2 percent Micro Solution; wash lids.
3. Rinse three times with tap water.
4. Rinse three times with deionized water.
5. Rinse three times with a 2N nitric acid solution.
6. Soak 24 hours in a 2N nitric acid solution.
7. Rinse three times with deionized water.

B.3 Cleaning Solutions

1. 2 percent phosphate-free laboratory-grade soap solution = 200 mL concentrated phosphate-free laboratory-grade soap solution per full 10 liter (L) bottle
2. 2 percent HNO_3 Acid = 80 mL concentrated HNO_3 acid (16N) per gallon of deionized water
3. 2 percent Micro = 80 mL concentrated Micro per gallon of deionized water

B.4 Equipment and Handling

1. Safety Precautions – All of the appropriate safety equipment must be worn by personnel involved in the cleaning of the bottles due to the corrosive nature of the chemicals being used to clean the bottles and tubing. This safety equipment must include protective gloves, lab coats, chemically resistant aprons, goggles with side shields, and respirators. All MSDS must be read and signed off by personnel.
2. A record book must be kept of each sample bottle washed, outlining the day the bottle was cleaned and checked off for passage of the quality control check.
3. Nitrile gloves must be worn while cleaning and handling bottles and equipment.

Care must be taken at all times to avoid introduction of contamination from any source.

APPENDIX C

LINEAR UNDERGROUND/OVERHEAD PROJECT MONITORING REQUIREMENTS

APPENDIX C LINEAR UNDERGROUND/ OVERHEAD PROJECT MONITORING REQUIREMENTS

C.1 Definition of Linear Underground/Overhead Projects

Linear underground/overhead projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities).

Construction activities associated with LUPs include, but are not limited to, activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities). Such activities may include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the Construction General Permit (CGP) where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction stormwater permit.

C.2 Monitoring Requirements Overview

Monitoring must be conducted to comply with the CGP. Table C-1 summarizes the requirements, which are detailed in the following subsections.

Table C-1. Summary of LUP Monitoring Requirements

LUP Risk Level	Visual Monitoring (Inspections)				Water Quality Monitoring (Sample Collection/Testing)		
	Daily Site BMP[1]	Pre-Storm[2]	Daily Storm BMP [3]	Post-Storm[4]	Stormwater Discharge (pH and turbidity)[5,6,7]	Non-Visible Pollutants[8]	Receiving Water[9,10]
1	✓					✓	
2	✓	✓	✓	✓	✓	✓	
3	✓	✓	✓	✓	✓	✓	✓

1 Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met). Inspections must continue after active construction until adequate permanent stabilization is established and, in areas where revegetation is chosen, until minimum vegetative coverage is established.

2 Within two business days (48 hours) prior to each event forecasted to be a qualifying rain event*. Because the size of a rain event cannot be predicted, an adequate trigger for a pre-storm event visual inspection would be the same as for a REAP: 50% or greater probability of producing precipitation of 0.1 inch or greater in the project area based on National Weather Service Forecast Office (National Oceanic and Atmospheric Administration). Photographs of the site taken during inspections must be submitted through the SWRCB's SMARTS website once every three rain events.

3 At least once each 24-hour period during any extended rain event. Photographs of the site taken during inspections must be submitted through SWRCB's SMARTS website once every three rain events.

4 Within two business days (48 hours) after each qualifying rain event.* Photographs of the site taken during inspections must be submitted through SWRCB's SMARTS website once every three rain events.

5 Minimum three samples per day during any rain event producing discharge. For dewatering discharges, Caltrans requires the turbidity of any sample must not exceed 200 NTU. The pH value of any sample must be within the range of 6.7 to 8.3 pH units.

6 Submit results to RE within 48 hours after storm event if either of the NAL is exceeded. RE submits results to SWRCB within 10 days after storm event if either of the NALs are exceeded. For Risk Level 3 projects, submit results to RE within 48 hours after storm event. RE submits results to SWRCB within five days after storm event. For projects with an ATS, if either of the NELs are exceeded, submit results to RE within six hours of NEL exceedance being identified. RE submits results to SWRCB within 24 hours after NEL exceedance has been identified.

7 Sampling and testing for pH and turbidity, and for suspended sediment concentration only if turbidity daily average Receiving Water Monitoring Trigger is exceeded in previous effluent samples.

8 If applicable; within first two hours of discharge from any rain event occurring during project working hours.

9 When a Receiving Water Monitoring Trigger is exceeded and the Risk Level 3 site has a direct discharge into receiving waters, sample upstream and downstream of discharge in receiving water.

10 Benthic Macroinvertebrate Bioassessment is required for projects disturbing 30 or more acres with direct discharge runoff to a freshwater wadeable stream that is either: (a) listed by SWRCB or the United States Environmental Protection Agency as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or has the beneficial use SPAWN & COLD & MIGRATORY. (Guidance on bioassessment monitoring is not included in this manual).

BMP = best management practices
LUP = linear underground/overhead projects
NAL = numeric action level
NEL = numeric effluent limitation
RE = resident engineer
REAP = Rain Event Action Plan
SMARTS = Storm Water Multi Application and Report Tracking System
SWRCB = State Water Resources Control Board

* A qualifying rain event is any event producing precipitation of 0.5 inch or greater over the duration of the rain event.

C.2.1 Who Should Monitor

See Section 4.1.3 for further information on monitoring requirements.

C.2.2 When Monitoring Should Occur

See Section 4.1.2 for further information on appropriate monitoring conditions (i.e., project working hours and safe conditions only).

Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

C.3 Monitoring & Reporting Program

A site-specific Monitoring and Reporting Program (M&RP) must be developed for each construction project prior to the commencement of construction activities. The M&RP must be revised as necessary to reflect project revisions, to ensure protection of water quality at all times throughout the life of the project. The M&RP must be implemented immediately at the start of construction for LUPs. The M&RP must be a part of the SWPPP. Section 700 of the *SWPPP Template* (Caltrans, 2011b) is devoted to the Construction Site Monitoring Program (CSMP) for traditional construction projects, and can be used to prepare a M&RP for LUPs. Section 2 of this guidance manual provides information on necessary elements that must be included in the CSMP. Each M&RP must address the CGP monitoring requirements specified for the risk level designated for the project, as detailed below.

The M&RP must be revised when:

- Site conditions or construction activities change such that a change in monitoring is required to comply with the requirements and intent of the CGP.
- The Regional Water Quality Control Board (RWQCB) requires the discharger to revise its M&RP based upon its review of the document. Revisions must be submitted by the Resident Engineer (RE) via postal mail or e-mail.
- RWQCB requires additional monitoring and reporting program activities, including sampling and analysis of discharges to Clean Water Act § 303(d)-listed water bodies.

C.4 Visual Inspections

Visual monitoring and site inspections must be performed on both a routine basis, and on a storm event basis, as shown in Table C-1. All visual inspections must be conducted during project working hours and in conjunction with other daily activities in areas where active construction is occurring. The routine (non-storm) and storm event-based inspections listed in Table C-1 are each described in detail below.

C.4.1 Daily Site BMP Inspections

For all risk levels, visual inspections and observations must be conducted daily during working hours, and in conjunction with other daily activities in areas where active construction is occurring. Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met). Inspections must continue after active construction until adequate permanent stabilization is established and, in areas where revegetation is chosen, until minimum vegetative coverage is established.

Daily visual inspections must be conducted to verify that:

1. Appropriate Best Management Practices (BMPs) for stormwater and non-stormwater are being implemented in areas where active construction is occurring (including staging areas).

2. Project excavations are closed, spoils are properly protected, and road surfaces are cleaned of excavated material and construction materials, such as chemicals, by either removing or storing the material in protective storage containers at the end of every construction day.

3. Land areas disturbed during construction are returned to preconstruction conditions or an equivalent protection is used at the end of each workday to eliminate or minimize erosion and the possible discharge of sediment or other pollutants during a rain event.

C.4.2 Pre-Storm, Daily Storm, and Post-Storm BMP Inspections

At Risk Level 2 and 3 sites, visual inspections must be conducted prior to anticipated storm events, during extended storm events, and after actual storm events to identify

areas contributing to a discharge of stormwater associated with construction activity. See Section 3.2.3 for inspection requirements.

If possible, install a rain gauge on site at an accessible and secure location with readings made during all rain event inspections. See Section 4.5 for additional information on rain gauges. When onsite readings are unavailable, data from the closest rain gauge with publicly available data may be used. These gauges may be operated by local, regional, state, or national agencies, such as county flood control districts or the National Weather Service.

Photographs of the site taken during inspections before, during, and after rain events must be submitted through the State Water Resources Control Board's (SWRCB) Storm Water Multi-Application and Report Tracking System (SMARTS) website once every three rain events.

C.5 Sample Collection and Testing

Discharge samples must be collected from the project site both during storm events and during non-storm periods, and tested as listed in Table C-1. Each monitoring type is listed in the subsections below. Refer to Section 4 for additional detail on sampling protocols.

C.5.1 Stormwater Discharge (pH and Turbidity)

Samples for stormwater discharge monitoring must be collected as described in Section 7.

C.5.2 Non-Visible Pollutants

For all risk level sites, samples for non-visible pollutant(s) monitoring must be collected as described in Section 5.

C.5.3 Receiving Water Monitoring

Receiving water monitoring is described in detail in Section 10.

C.6 Data Evaluation, Follow-up, and Recordkeeping

C.6.1 Data Evaluation – Stormwater Discharges (pH and Turbidity)

See Section 7.6 for information on evaluating stormwater discharge data.

C.6.2 Data Evaluation – Non-Visible Pollutants

See Section 5.5 for information on evaluating non-visible pollutant data.

C.6.3 Recordkeeping

Retain all reports and records (including completed inspection forms) of all visual inspections and of sample testing for a period of at least three years from the time the SWRCB accepts the Notice of Termination or the Notice of Completion of Construction. Records may be retained off site and made available upon request. Complete the following forms and submit to the RE as detailed in Section 11:

Prior to rain event or monitoring:

- CEM-2058 Stormwater Meter Calibration Record – Specialty Meters (if required)

During or after monitoring:

- CEM-2051 Stormwater Sampling and Testing Activity Log – Optional Form
- CEM-2052 Stormwater Sample Field Test Report form, and
- CEM-2061 Notice of Discharge Report form (if required)
- CEM-2062 NAL Exceedance Report form (if required)
- CEM-2063 NEL Violation Report form – ATS Discharges (if required)

See Section 11 for detailed information on reporting and recordkeeping requirements.

APPENDIX D

ACTIVE TREATMENT SYSTEM
CGP MONITORING PROTOCOLS

APPENDIX D ACTIVE TREATMENT SYSTEM CGP MONITORING PROTOCOLS

D.1 Permit Requirements

The use of an Active Treatment System (ATS) may be necessary on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion, or under circumstances where stormwater discharges leaving the site may cause or contribute to an exceedance of a receiving water quality standard. An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to reduce turbidity caused by fine suspended sediment. Additionally, it may be appropriate to use an ATS when site constraints prohibit the construction of a correctly-sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

An ATS is operated in one of two modes, either batch or flow-through. In batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. In flow-through treatment, water is pumped into the ATS directly from the runoff collection system or stormwater holding pond, where it is treated and filtered as it flows through the system, and is then continuously discharged.

The CGP requires visual monitoring, operational and (effluent) compliance monitoring, and, for an ATS operating in batch mode, toxicity monitoring (further described in Section D.3). This appendix presents the CGP requirements for ATS monitoring. Additional, Caltrans-required monitoring for ATS installations is described in Section 9, and is designed to provide quality assurance for the ATS instrumentation, which automatically measures and records effluent water quality data.

D.1.1 Numeric Effluent Limits

The CGP establishes NELs for discharges from construction sites that utilize an ATS:

1. Turbidity of all ATS discharges must be less than 10 NTU for daily flow-weighted average of all samples and 20 NTU for any single sample.

2. pH must be within the range of pH NELs (i.e., above 6.0 and below 9.0).

3. Residual coagulant/flocculant chemical must be less than 10 percent of Maximum Allowable Threshold Concentration (MATC) for the most sensitive species of the

chemical used. The MATC is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC must be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for the most sensitive species determined for the specific coagulant. The most sensitive species test must be used to determine the MATC. The contractor should contact the chemical vendor or manufacturer to obtain the chemical's MATC.

Exemption: Discharges of stormwater from an ATS must comply with applicable NELs (above) unless the precipitation event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10-year, 24-hour storm event, as determined using the following maps, available online.

Isopluvials of 10-year, 24-hour precipitation for the northern half of California in tenths of an inch (divide number on map by 10 to get inches) available at:
http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif

Isopluvials of 10-year, 24-hour precipitation for the southern half of California in tenths of an inch (divide number on map by 10 to get inches) available at:
http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif

This exemption is dependent on the submission of rain gauge data verifying that the storm event is equal to or larger than the Compliance Storm. A rain gauge must be installed on site as per contract special provisions.

If ATS effluent is authorized to discharge into a sanitary sewer system, the operator must comply with any pre-treatment requirements applicable for that system. Any specific criteria required by the municipality or other sanitary sewage agency must be included in the ATS Plan.

If a qualifying residual chemical/additive test does not exist, the ATS must be operated in batch mode. An ATS operating in a batch treatment mode of operation must perform Whole Effluent Toxicity (WET) testing as described in Section D.3.

The CGP also specifies ATS design and operation requirements; see CGP Attachment F.

D.1.2 Required Plans

The CGP requires the following plans to be developed:

- **ATS Plan.** An ATS Plan must be prepared that combines the site-specific data and treatment system information required to safely and efficiently operate an ATS. The ATS Plan must be electronically submitted to the SWRCB at least 14 days prior to the planned operation of the ATS and a paper copy must be available onsite during ATS operation. At a minimum, the ATS Plan must include:
  - ATS O&M Manual for all equipment.
  - ATS Monitoring, Sampling & Reporting Plan, including QA/QC. If ATS effluent is authorized to discharge into a sanitary sewer system, any pre-treatment requirements applicable for that system must be included in the ATS Plan.
  - ATS Health and Safety Plan.
  - ATS Spill Prevention Plan.
- **O&M Manual.** A site-specific O&M manual must be prepared covering the procedures required to install, operate and maintain the ATS. The manual is typically in a modular format covering generalized procedures for each component that is utilized in a particular system. The O&M manual must only be used in conjunction with appropriate project-specific design specifications that describe the system configuration and operating parameters. The O&M manual must have operating manuals for specific pumps, generators, control systems, and other equipment.
- **QA/QC Plan.** A project-specific Sampling and Reporting QA/QC Plan must be prepared, and must include at a minimum:
  - Calibration – Calibration methods and frequencies for all system and field instruments must be specified. Instrument method detection limit or sensitivity verification, laboratory duplicate procedures, and other pertinent procedures must also be specified.
  - Method Detection Limits (MDLs) – The methods for determining MDLs must be specified for each residual coagulant measurement method. Acceptable minimum MDLs for each method, specific to individual coagulants, must be specified.

- Laboratory Duplicates – Requirements for monthly laboratory duplicates for residual coagulant analysis must be specified.
- Manufacturer's recommendations for installation and maintenance of instrumentation (flow meters, probes, valves, streaming current detectors, controlling computers, etc.).

D.2 Who Should Monitor

Caltrans requires the WPC manager to perform or supervise the collection and testing of grab samples for pH, turbidity, and residual chemical/additive to verify continuous monitoring measurements.

The ATS must be installed and operated by a qualified person who has either a minimum of five years construction stormwater experience or who is a licensed contractor specifically holding a California Class A Contractors license.

D.2.1 Training

In addition, ATS operators must have training specific to using an ATS and liquid coagulants for stormwater discharges in California. The training must be in the form of a formal class with a certificate and requirements for testing and certificate renewal. Training must include a minimum of 8 hours classroom and 32 hours field training. The course must cover the following topics:

1. Coagulation Basics – Chemistry and physical processes
2. ATS System Design and Operating Principles
3. ATS Control Systems
4. Coagulant Selection – Jar testing, dose determination, etc.
5. Aquatic Safety/Toxicity of Coagulants, proper handling and safety
6. Monitoring, Sampling, and Analysis
7. Reporting and Recordkeeping
8. Emergency Response

D.3 What to Monitor

For any project using an ATS, the following monitoring must be conducted:

1. Visual Monitoring

A qualified ATS operator (per Section D.2) must be on site at all times during treatment operations. Daily onsite visual monitoring of the system for proper performance must be conducted and recorded in the project data log. The log must include the name and phone number of the person responsible for system operation and monitoring. The log must include documentation of the responsible person's training.

2. Operational and Compliance Monitoring

a. Flow must be continuously monitored and recorded at not greater than 15-minute intervals for total volume treated and discharged.

b. Influent and effluent pH must be continuously monitored and recorded at not greater than 15-minute intervals.

c. Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at not greater than 15-minute intervals.

d. The type and amount of chemical used for pH adjustment, if any, must be monitored and recorded.

e. Dose rate of chemical used in the ATS system (expressed in milligrams per liter) must be monitored and reported 15-minutes after startup and every 8 hours of operation.

f. Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records must be maintained on site.

g. If continuous residual chemical/additive monitoring is possible, residual chemical must be continuously monitored and recorded at not greater than 15-minute intervals. If continuous residual chemical/additive monitoring is not possible, effluent levels of residual chemical/additive must be monitored and recorded within one hour after startup and at least once during every 8 hours of operation thereafter. If a qualifying residual chemical/additive test does not exist, the ATS must be operated in a batch treatment mode of operation and toxicity testing of effluent must be performed as detailed below.

h. If an ATS that discharges directly into receiving waters violates an NEL, the receiving waters must be subsequently monitored for pH, turbidity, and/or SSC (as applicable, based on the NEL that was exceeded), and any additional parameters for which monitoring is required by RWQCB, for the duration of coverage under the CGP. See Section 10 for information on receiving water sampling.

3. Toxicity Monitoring - Batch Mode WET Testing

An ATS operating in a batch treatment mode of operation must perform WET testing. Samples must be collected for acute toxicity testing and the testing must be initiated on effluent samples representing discharge from each batch prior to discharge. Testing results do not need to be obtained prior to discharge. All toxicity testing must be performed by a laboratory certified under the DHS Environmental Laboratory Accreditation Program for WET testing (field testing E113). The toxicity test must follow methods specified for the 96-hour acute test in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, USEPA-821-R-02-012 (http://www.epa.gov/waterscience/methods/wet/disk2/) for fathead minnow (*Pimephales promelas*), or alternatively for rainbow trout (*Oncorhynchus mykiss*). All toxicity tests must meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

All acute toxicity testing must be electronically reported.

D.4 Where to Monitor

Measurements must be made continuously (every 15 minutes or more frequently) for flow rate, pH, and turbidity at influent and effluent points of the ATS.

ATS effluent samples must be collected for residual chemicals from the discharge pipe or another location representative of the nature of the discharge.

Toxicity test samples must be representative of the discharge, and must be collected prior to discharge of the batch treatment system. In practical terms, this means collection of the toxicity test sample near the batch tank outlet.

If an ATS that discharges directly into receiving waters violates an NEL, the receiving waters must be subsequently monitored for the duration of coverage under the CGP, both upstream and downstream from the discharge location. See Section 10 for additional information on receiving water monitoring.

D.5 When to Monitor

Table D-1 summarizes the required timing for visual monitoring, continuous operational monitoring, effluent compliance monitoring, and toxicity test sampling.

Table D-1

ATS Monitoring Frequency

Monitoring/Sampling	Frequency
Flow	At least every 15 minutes.
pH (influent and effluent)	At least every 15 minutes.
Turbidity (influent and effluent)	At least every 15 minutes.
Type and amount of chemical used for pH adjustment	Every time chemical is used.
Chemical dose rate	Within 15 minutes after startup and once during every eight hours of operation thereafter.
Laboratory duplicates	Monthly.
Residual Chemical Testing	At least every 15 minutes, or if continuous residual chemical/additive monitoring is not possible, within one hour after startup and once during every eight hours of operation thereafter.
Toxicity Testing	Samples must be collected prior to discharge from the batch treatment system.
Receiving Water (if required)	Samples must be collected each day that receiving waters receive ATS discharges.

D.6 How to Monitor

D.6.1 ATS Instrumentation

The ATS must be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate. Systems must be equipped with a data recording system, such as a data logger or webserver-based system, which records turbidity, pH, and flow rate measurements at a frequency no less than once every 15 minutes. Cumulative flow volume must be recorded daily. Residual chemical measurements must be tested and recorded at least 15 minutes after startup and every 8 hours of operation. The data recording system must have the capacity to record a minimum of seven days of continuous data. The minimum data recorded must include:

- Influent Turbidity
- Effluent Turbidity
- Influent pH

- Effluent pH
- Effluent Flow rate
- Effluent Flow volume

Instrumentation systems must be interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH. The system must also assure that upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.

Residual treatment chemical also must be monitored, but chemical-specific sensors do not exist for many of these chemicals; therefore, if continuous monitoring is not possible, residual chemical testing must be performed on a discrete (not continuous or automated) basis, as described below.

D.6.2 Effluent Residual Chemical Samples

Samples must be collected from the outlet pipe such that they are representative of the flow and characteristics of the discharge. Sampling techniques are described in detail in Section 4.

Samples must be tested on site according to the following criteria:

- A residual chemical test method must be utilized that has an MDL of 10 percent or less than the MATC for the specific coagulant in use and for the most sensitive species of the chemical used.
- The residual chemical test method must be capable of producing a result within one hour of sampling.
- A California state-certified laboratory must validate the selected residual chemical test. Specifically the lab must review the test protocol, test parameters, and the detection limit for the specific chemical. This documentation must be electronically submitted as part of the ATS Plan.

If a residual chemical test method cannot be utilized that meets the requirements above, the ATS must be operated in batch treatment mode, and toxicity testing is then required, as described below.

D.6.3 Toxicity Test Samples

Toxicity test samples must be collected prior to discharge of the batch treatment system, and must be representative of the discharge. In practical terms, this means collection of

the toxicity test samples near the batch tank outlet. Toxicity testing methods are defined in Section D.3 above.

D.6.4 Receiving Water Samples

See Section 10 for information on receiving water sampling.

D.7 Recordkeeping

Daily onsite visual monitoring of the system for proper performance must be conducted and recorded in the project data log. The log shall include the name and phone number of the person responsible for system operation and monitoring, as well as documentation of the responsible person's training.

The ATS must be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate. These systems must be equipped with a data recording system, such as a data logger or webserver-based system, which records each measurement on a frequency no less than once every 15 minutes. The data recording system must have the capacity to record a minimum of seven days of continuous data.

At a minimum, every 30 days the RE must access the SWRCB's Storm Water Multi-Application and Report Tracking System (SMARTS) and electronically upload field data from the ATS. Records must be kept for three years after the project is completed.

If any monitoring data exceeds any applicable NEL, a NEL Violation Report must be submitted to the RE within six hours after the violation is identified (NEL Violation Report – ATS Discharges form, CEM-2063) per the contract special provisions. The RE will electronically submit a NEL Violation Report to the SWRCB within 24 hours after the NEL exceedance has been identified. An electronic or paper copy of each NEL Violation Report must be retained for a minimum of three years after the date the annual report is filed. A paper copy of each ATS specification must be maintained on site.

D.8 Data Evaluation, Follow-up, and Reporting

D.8.1 Data Evaluation

Results of effluent testing for pH, turbidity, and residual coagulant/flocculant chemical levels (for ATS in flow-through mode) are compared to NELs (see Table D-2) to determine if further action is required.

Discharges of stormwater from an ATS must comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10-year, 24-hour storm event, as determined using these maps found at the following locations:

Isopluvials of 10-year, 24-hour precipitation for the northern half of California in tenths of an inch (divide number on map by 10 to get inches) available at:
http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif

Isopluvials of 10-year, 24-hour precipitation for the southern half of California in tenths of an inch (divide number on map by 10 to get inches) available at:
http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif

This exemption is dependent on the submission of rain gauge data verifying the storm event is equal to or larger than the Compliance Storm Event.

D.8.2 Assessing the Need for Corrective Measures

All results of pH, turbidity, and residual chemical additives testing must be compared to the NELs shown in Table D-2. Corrective measures are required for NEL exceedances as detailed below.

D.8.3 Implementing Corrective Measures

Procedures for evaluating appropriate corrective measures for NEL exceedances could include:

1. Evaluate the ATS operating procedures and chemicals to determine appropriate operational changes. For example, evaluate if the residence time should be lengthened. Should a different chemical or chemical dose be used? Was there an accidental discharge of settled floc?

2. Evaluate if the ATS requires maintenance. For example, evaluate if the differential pressure measurements indicate the filtration unit needs back-flushing or replacement.

Table D-2

ATS Test Methods, Reporting Limits, Reporting Units and Numeric Effluent Limitations

Parameter	Test Method/ Protocol	Discharge Type	Reporting Limit	Reporting Units	Maximum Holding Time	Numeric Action Level	Numeric Effluent Limitation
pH	Field Test with calibrated instrument	For ATS Discharges	0.2[1]	pH units	15 minutes	N/A	Lower NEL = 6.0 Upper NEL = 9.0
Turbidity	Field test with calibrated instrument	For ATS Discharges	1	NTU	48 hours	N/A	10 NTU for Daily Flow-Weighted Average & 20 NTU for Any Single Sample
Residual coagulant/ flocculant chemical	Discharger selected test method meeting CGP requirements[2]	For ATS Discharges operating in flow-through mode	10% or less than MATC[3] for most sensitive species	Test method specific	Test method specific	N/A	< 10% of MATC[3] for most sensitive species

[1] Measured on a scale of 0-14; must be able to read within +/- 0.2 pH units.

[2] A test method that produces a result within one hour of sampling and is validated by a California state-certified laboratory. Specifically, the lab must review the test protocol, test parameters, and the detection limit of the coagulant.

[3] The MATC is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC must be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the NOEC and LOEC Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant.

ATS = active treatment system
CGP = Construction General Permit
LOEC = Lowest Observed Effect Concentration
MATC = Maximum Allowable Threshold Concentration
N/A = not applicable
NEL = numeric effluent limitation
NOEC = No Observed Effect Concentration
NTU = nephelometric turbidity unit
< = less than

3. Evaluate if the ATS requires repairs or redesign.

Corrective actions must be implemented as soon as possible.

D.8.4 Reporting

Procedure for Reporting and Correcting NEL Exceedances

In the event that the daily average or maximum ATS effluent measurement exceeds an applicable NEL (ATS projects only):

- If any monitoring result exceeds any applicable NEL, the system operator must immediately notify the RE, and an NEL Violation Report must be submitted to the RE within six hours after the violation is identified (Numeric Effluent Limitation Violation Report – ATS Discharges form, CEM-2063) per the contract special provisions. The RE will electronically submit an NEL Violation Report to SWRCB *within 24 hours after the NEL exceedance has been identified*.
- If stormwater runoff has a direct discharge into receiving waters, the receiving waters must be subsequently sampled (upstream and downstream of outfall) for pH, turbidity, and any additional parameters for which monitoring is required by RWQCB.
- If the turbidity daily average NEL is exceeded, subsequent effluent samples must be analyzed for SSC in addition to pH and turbidity.

NEL Violation Report. The NEL Violation Report must be certified by the RE in accordance with Section IV of the CGP and include:

- The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results less than the method detection limit shall be reported as "less than the method detection limit").
- The date, time, and place of sampling activities, visual inspections, and/or measurements, including rain gauge readings.
- A description of the current onsite BMPs, and the corrective actions taken to manage NEL exceedance.

Compliance Storm Exemption. In the event that an applicable NEL is exceeded during a storm event equal to or larger than the Compliance Storm Event (10-year, 24-hour

storm), report the onsite rain gauge reading and nearby governmental rain gauge readings for verification.

Compliance storm event verification must be done by reporting the onsite rain gauge readings, with verification from nearby governmental rain gauge readings.

For ATS installations with direct discharge into receiving waters, the following additional provisions apply:

- If stormwater has direct discharge into receiving waters and a NEL is violated, the receiving waters must be subsequently monitored for pH, turbidity, and any additional parameters for which monitoring is required by RWQCB.
- If the turbidity daily average NEL is exceeded, subsequent effluent samples must be analyzed for SSC in addition to pH and turbidity.

Procedure for Reporting Acute Toxicity Test Results

Upon receipt of any toxicity test results indicating acute toxicity to the test organism, the RE must be immediately notified, and the laboratory test results must be submitted to the RE within six hours of receipt. The RE must then submit the results indicating acute toxicity to the RWQCB within 24 hours after receipt of the laboratory test results.

Routine Reporting of Results

All toxicity testing results must be submitted to the RE within 48 hours of receipt of the results from the toxicity testing laboratory. The RE will electronically report the results to the SWRCB within five business days of receipt of laboratory test results.

The contractor must submit all pH, turbidity, and residual chemical monitoring results to the RE weekly (CEM-2052).

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APPENDIX E

CALTRANS OVERSIGHT MONITORING

APPENDIX E CALTRANS OVERSIGHT MONITORING

E.1 Requirements

The RE's SWPPP inspector will perform oversight stormwater monitoring of Risk Level 1, 2, and 3 projects. Visual monitoring requirements for Risk Level 1, 2, and 3 projects are summarized in Table E-1.

Table E-1.

Caltrans Oversight Visual Monitoring

Type	Frequency	Protocol
Daily	Weekly	Inspector will ensure that contractor is conducting and recording inspections, and implementing corrective actions (see Section 3).
Quarterly Non-Stormwater	Quarterly	Inspector will ensure that contractor is conducting and recording inspections, and implementing corrective actions (see Section 3).
Pre Storm	As occurs	Inspector will ensure that contractor is conducting and recording inspections, and implementing corrective actions (see Section 3).
Daily During Storm	As occurs	Inspector will ensure that contractor is conducting and recording inspections, and implementing corrective actions (see Section 3).
Post Storm	As occurs	Inspector will ensure that contractor is conducting and recording inspections, and implementing corrective actions (see Section 3).
Weekly BMP	Weekly	Inspector will conduct weekly BMP inspections concurrently with the contractor and record the observations on CEM-2030 Stormwater Site Inspection Report form.
Weather	Daily	The inspector will ensure that the contractor is conducting daily weather monitoring. In addition, the inspector will monitor the weather reports for rainfall predictions on a daily basis. If rainfall is predicted, direct the contractor to deploy appropriate BMPs as identified in the SWPPP or WPCP (CT Construction Manual Section 7-104B [3]). For Risk Level 2 and 3 projects, if a Likely Precipitation Event is forecast, direct the contractor to prepare and implement a REAP.

The RE's SWPPP inspector will perform oversight sampling of Risk Level 2 and 3 projects. Oversight sampling requirements for Risk Level 2 and 3 projects are summarized in Table E-2. Oversight stormwater sampling will be performed at a minimum of once annually. The monitoring will be done concurrently with the contractor's sampling during a qualifying rain event. For projects discharging into

sensitive water bodies, when Numeric Action Levels have been exceeded, or if the contractor's sampling methods are determined to be inconsistent with required sampling procedures, additional or more frequent oversight sampling may be necessary.

Table E-2. Caltrans Oversight Sampling

Type	Frequency	Protocol
Non-Visible Pollutants	As occurs	Inspector will observe the contractor's collection of non-visible pollutant samples to ensure that proper procedures are being followed (see Section 5).
Non-Stormwater Discharge	Once during each new discharge event	Inspector will observe contractor field sampling or collection of samples for laboratory analysis for all first time, non-stormwater discharges to ensure that proper procedures are being followed (see Section 6).
Stormwater Discharge	Once Annually	Inspector will perform duplicate sampling at all discharge locations during one rain event at each Risk Level 2 and Risk Level 3 project annually. Inspector will follow the same sampling procedures required of the contractor (see Section 7).
RWQCB Required	Once Annually (if required)	Inspector will observe contractor field sampling or collection of samples for laboratory analysis for any RWQCB required monitoring to ensure that proper procedures are being followed (see Section 8).
ATS	Once per day	When an ATS is discharging water from the project site, Caltrans requires effluent grab samples be collected and analyzed for pH and turbidity on a daily basis. Collect a minimum of one effluent grab samples per day and test for pH and turbidity using a handheld meter to verify the continuous pH and turbidity monitoring. (see Section 9).
Receiving Water	Once Annually	Inspector will observe contractor field sampling or collection of samples for laboratory analysis for any permit required receiving water monitoring to ensure that proper procedures are being followed (see Section 10).

What and When to Monitor

The Caltrans stormwater site inspector and contractor inspector must coordinate activities to select the sampling locations and schedule the time to meet for collection of simultaneous samples for QA/QC purposes (see Section 7.2 for additional detail). Samples must be collected at the same locations and as close to the same time as possible to accurately compare sampling results. While the contractor must collect three effluent samples from each representative discharge point on a sampling day, oversight samples need to be collected at each location only once that day.

All oversight sampling locations will be monitored for pH and turbidity, and the results will be recorded on a field monitoring form (CEM-2052).

E.3 Where to Monitor

Refer to the contractor's SWPPP and the REAP prepared for the current rain event to obtain the representative discharge points where samples will be taken.

E.4 How to Monitor

Manual grab sampling techniques will be used to collect samples. See Section 4.6.4 for detailed information on grab sample collection and analysis for pH and turbidity. Samples must be representative of the flow and characteristics of the discharge. The sampled stormwater discharge should represent the effluent in each drainage area, based on visual observation of the water and upstream conditions.

E.5 Data Evaluation, Follow-up, and Reporting

Immediately upon obtaining oversight sampling results at each location, those results will be compared to the results obtained by the contractor's inspector. If oversight sample results are not consistent with the contractor's results (i.e., relative percentage difference for turbidity is greater than 30 percent or pH differs by more than 0.2 pH units), it may be for one of the following reasons:

- The contractor's or the oversight inspector's field meters may not have been properly calibrated.
  - Action required: Check calibration records, recalibrate equipment and resample. If contractor's equipment is found to be faulty, direct the contractor to obtain backup field meter(s).
- Samples were taken at different times or locations.
  - Action required: Resample at the same location and time.
- Proper sampling protocols are not being followed.
  - Action required: Resample using proper methods. If contractor's sampler has not been properly trained, direct the contractor to have that individual properly trained or replaced with a properly trained person. If the contractor sampling results are deemed to be inaccurate, the oversight sampling results may be used to satisfy CGP reporting requirements, and the contractor will not be paid for a Sampling and Analysis Day.

All oversight monitoring records will be filed in Category 20 of the project files along with the contractor's monitoring records.

The inspector will brief the RE on the results of the oversight monitoring for follow-up and appropriate contract enforcement if required.

If the contractor obtains sufficient valid sampling results to satisfy CGP SMARTS reporting requirements, only the contractor's sampling results will be entered into SMARTS.

If the contractor's sampling efforts are determined to be invalid, the oversight monitoring results may be used to satisfy the CGP requirements, and the RE will enact appropriate contractual enforcement actions per the contract Standard Specifications. Such actions may include:

- Retention of a portion of the monthly progress pay estimate
- Dismissal of the contractor's sampling personnel or subcontractor
- Bringing in a separate contractor to perform the work