Construction Storm Water Training for Management
2-Hour Module
General Overview of Storm Water Requirements
Introduction

- **Course Highlights**
  - General Overview of Storm Water Requirements
  - Consequences of Non-Compliance
  - Causes of Erosion
  - Categories of BMPs to Prevent Erosion and Water Pollution
  - Dewatering Requirements
  - Sampling and Analysis
Why is Clean Water Important

Plants and Smaller Organisms

Fish

Waterfowl

Wildlife

Livestock

People

All of these life forms depend on clean water for their existence
Impacts of Erosion

- Sediment is the number one pollutant of the nation's rivers and lakes.

- “An estimated 80 Millions Tons of solids are discharged annually from construction sites into receiving waters.”

According to the EPA
Impacts of Erosion

“On a unit basis, construction sites export sediment at 20 to 1,000 times the rates of other land uses.”

According to the EPA
Construction Site Pollutants

Erosion and Sedimentation

Construction Wastes
Construction Site Pollutants

- One gallon of oil has the potential to contaminate up to one million gallons of water

*StormWater/CleanWater protection program*
1972 Federal Clean Water Act (CWA)
- Amend to Prohibit Any Discharge of Pollutants from a Point Source

1987 Amendments to the CWA
- Added Section 402(p) Establishing the Framework for Regulations Regarding Municipal and Industrial Discharges

1990 EPA Published Final Regulations
- Established Permit Requirements for Storm Water Discharges Associated with Industrial (Including Construction) Activities

1992 California’s General Permit was Adopted
- Established Requirements for Discharges Associated with Construction Activities
- Revised in 1999; Modified in 2001 to Include Monitoring – 02 Permit
- Modified in 2002; Effective March 10, 2003 Construction Activity with Soil Disturbance = 1 acre

1999 Caltrans NPDES Permit was issued – 03 Permit and Storm Water Management Plan (SWMP)
General Construction Permit Objectives

- To restore or protect the beneficial uses of our water resources
- Applies to projects that disturb one acre or more
- Storm Water Pollution Prevention Plan (SWPPP)
- Monitoring Program and Reporting Requirements (M&RP)
- SWPPP and M&RP must be implemented concurrent with the commencement of construction
- Note: Water Pollution Control Programs are Required for Projects that Disturb < 1 Acre
### SWPPP/WPCP Differences

**SWPPP**
- = 1 acre
- Comply with Federal and State Regulations
- Comply with SWRCB’s NPDES Construction General Permit
- NOC/WDID Required
- Comprehensive Plan Including:
  - Certifications
  - Project Description
  - Roles/Responsibilities
  - Location and Site Maps
  - Run-on and Runoff Calculations
  - Potential Pollutant Sources
  - Temporary and Post-Construction BMPs
  - Detailed Inspection/Maintenance Requirements
  - Training
  - Sampling and Analysis Plan

**WPCP**
- <1 acre
- Caltrans-required
- NOC/WDID Not Required
- Abbreviated Plan Including:
  - Project Description
  - Roles/Responsibilities
  - Location and Site Maps
  - Potential Pollutant Sources
  - Temporary BMPs
  - Training
Who Enforces These Laws/Permits?

- EPA
- SWRCB / RWQCB
- Other Agencies

- Private Citizens
  - NRDC
  - Baykeepers
  - Other Watchdog Groups
Notification of Construction (NOC)

- Submitted to RWQCB at least 30 days prior to construction
- Equivalent to Notice Of Intent (NOI)
- Included information:
  - Tentative start date and duration
  - Estimate of affected acres and vicinity map
  - RE in charge and telephone number
  - Field office information and location map
SWPPP Requirements

- SWPPP should be a dynamic, defensible, living document
- Identify pollutant sources or potential pollutant sources that may impact storm water discharges
- Implement BMPs to reduce pollutants in storm water discharges from the construction site.
- Monitor the site and perform inspections of control practices implemented as part of the SWPPP
- Document the inspections and the results, as well as corrective action which is to be taken as a result
- Evaluate and revise controls, and amend the SWPPP
SWPPP Outline

I. Title Page
II. Certification Page
III. Amendments
IV. Table of Contents
V. Introduction
VI. Source Identification
   I. Topography Map
   II. Site Map
VII. Narrative Descriptions

I. Site Estimates and Descriptions of Onsite Soil
II. Pollutants Likely to be Present in Storm Water Discharges
III. Toxic Materials
IV. Erosion and Sediment Control Practices
V. Non-Storm Water Management
VI. Maintenance, Inspection and Repair of Structural Controls
VII. Spill Prevention and Control
VIII. Post-Construction Storm Water Management (Permanent)
IX. Personnel Training
X. Lists of Contractors/Sub-Contractors
XI. Other Plans
XII. Monitoring and Documentation
Example
Water Pollution Control Drawing

1. Areas of soil disturbance
2. Surface water locations
3. Areas of existing vegetation to be preserved
4. Drainage patterns and slopes as they will appear after major grading is completed
5. Areas and methods of storage for soils, materials and wastes
6. Vehicle and equipment storage and service areas
7. Existing and planned paved areas and buildings
8. Location and type of post-construction control practices
Inspection Requirements

- Rainy Season Inspections
  - At least weekly
  - Prior to a forecast storm
  - After a rain event that causes runoff from the construction site and
  - At 24-hour intervals during extended rain events and
  - As specified in project Special Provisions

- Non-Rainy Season Inspections
  - At least every 2 weeks
  - Prior to a forecast storm
  - After a rain event that causes runoff from the construction site and
  - At 24-hour intervals during extended rain events and
  - As specified in project Special Provisions or District requirements

- Implementation Requirements
  - Are the Recommended Combination of BMPs being implemented per Table 2-2, and 2-3
  - Are the appropriate Non-Storm Water Management BMPs being used
  - Are the appropriate Waste Management and Materials Pollution Control BMPs being used
NCC Requirements

- The Notice of Completion of Construction (NCC) equivalent to the NOT
- Meet Final Stabilization Requirements
  - Special Provision requirements
  - NPDES permit requirements
- Insert into SWPPP Attachment P at end of project
- Only required for SWPPP projects

Caltrans Guidance Manuals

- Caltrans Storm Water Quality Handbooks and Manuals
  - Project Planning and Design Guide
  - SWPPP/WPCP Preparation Manual
  - Construction Site BMPs Manual
  - Guidance for Temporary Soil Stabilization
  - Field Guide to Construction Dewatering

- Get Manuals online at [http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm](http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm) or hard copies are available from Caltrans Publications
Consequences of Non-Compliance
Summary of Fines and Penalties

- Federal – fines of up to $32,500 PER DAY can be imposed for UNINTENTIONAL violation, up to $55,000 per day for an INTENTIONAL violation, in addition to criminal liability and responsibility for cleanup costs.

- State – Penalties of up to an additional $10,000 per day plus $10/gallon of sediment-laden or polluted water discharged for each violation.

- Failure to Submit a Notice of Intent for Coverage under the appropriate storm water NPDES permit. Minimum $5,000 plus recovery of staff costs.

- Failure to submit an annual report of construction certification when required by the Regional Board. Minimum $1,000 plus recovery of staff costs.

- Violation of Permit Terms or Basin Plan Prohibitions. Minimum amount is the economic savings of the violation.

Current Regulatory Atmosphere
- “The Learning Curve is Over”
Violation and Order for Compliance
1998 District 12

USEPA Region 9 Cited Contractor and Agency as Follows:

- “…excessive amounts of sediment to the storm drain…”
“...excessive amounts of sediment to the storm drain...”

“...discharge of false work and miscellaneous construction debris to ...Creek and ... River.”

“ A sheen of fuel floating on the storm water ... 40 feet from a drain inlet.”
Violation and Order for Compliance
1998 District 11

“..sloppy runoff-control practices at Caltrans construction sites, drainage facilities and maintenance yards”

San Diego Baykeeper
Causes of Erosion
Definition of Erosion

- Soil erosion is the **process** by which soil particles become detached by water, wind, or gravity and are transported from their original location.
Types of Erosion

- Splash Erosion
- Sheet Erosion (Overland Flow)
- Rill Erosion
- Gully Erosion
- Channel Erosion
Splash Erosion

- Rain drops striking bare soil directly at 20 mph
  - Detaches soil particles
  - Particles can then be transported by the action of water and/or wind
Sheet Erosion (Overland Flow)

- The removal of a uniform thin layer of soil by raindrop splash or water run-off
- Surface film of water 2-3 mm deep
- This process may occur unnoticed on exposed soil even though raindrops are eroding large quantities of soil
- This process eventually becomes more dramatic via the formation of rills and gullies
Rill Erosion

- Shallow surface flows that become condensed
- Increased velocity and turbulence.
- Well-defined tiny channels
- The rate of rill erosion can be approximately 100X greater than sheet erosion
Gully Erosion

- Accumulating runoff becomes concentrated and forms small rills throughout the soil
- Several rills may form throughout a slope and eventually may join together to form Gullies
- The rate of gully erosion can be approximately 100X greater than rill erosion
Channel Erosion

- Results from increased volume, velocity and or duration of flow, and concentration of flow - primarily from increased impervious surfaces.
- Channel erosion occurs in areas where tributaries, storm drains and or culverts flow into unprotected channels.
Turbidity/Sedimentation

- Turbidity is solid particulate matter, that is in suspension and is being transported.

- Sedimentation is the deposition of the eroded material.
Categories of BMPs to Prevent Erosion and Water Pollution
BMP Installation

**BMP Categories**

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

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<tr>
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<td>Scheduling</td>
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<td>Preservation of Existing Vegetation</td>
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<td>Hydraulic Mulch</td>
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<td>Hydroseeding</td>
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<td>Soil Binders</td>
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<td>SS-6</td>
<td>Straw Mulch</td>
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<td>SS-7</td>
<td>Geotextiles, Plastic Covers, &amp; Erosion Control Blankets/Mats</td>
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<td>SS-8</td>
<td>Wood Mulching</td>
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<td>SS-9</td>
<td>Earth Dikes/Drainage Swales &amp; Lined Ditches</td>
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<td>SS-10</td>
<td>Outlet Protection/Velocity Dissipation Devices</td>
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<td>Slope Drains</td>
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<td>SS-12</td>
<td>Streambank Stabilization</td>
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</table>
Soil Preparation

- Proper preparation of the soil is necessary prior to the application of soil stabilization materials.
Soil Preparation

Tracking: With machinery set up and down the slope provides grooves that will catch soil, rainfall, and reduce runoff.

Contour Furrows: Will catch seeds, fertilizers, mulch, and decrease runoff.

Surface Roughening:
Soil Stabilization

Unstabilized slope vs. Stabilized slope
Inadequate Soil Stabilization

Lack of soil stabilization
Inadequate Soil Stabilization
Adequate Soil Stabilization

Proper of soil preparation and stabilization
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<tr>
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<td>Sediment / Desilting Basin</td>
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<td>Sediment Trap</td>
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<td>SC-4</td>
<td>Check Dam</td>
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<td>SC-5</td>
<td>Fiber Rolls</td>
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<td>SC-6</td>
<td>Gravel Bag Berm</td>
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<td>Street Sweeping and Vacuuming</td>
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<td>SC-8</td>
<td>Sandbag Barrier</td>
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<td>SC-9</td>
<td>Straw Bale Barrier</td>
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<td>SC-10</td>
<td>Storm Drain Inlet Protection</td>
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</table>
Inadequate Sediment Control

Improper silt fence application can cause erosion

Incorrect application – across concentrated flow

Incorrect - up and down slopes
Inadequate Sediment Control

Improperly installed hay bales
Adequate Sediment Control

Proper silt fence and fiber roll installation
Adequate Sediment Control

Proper drain inlet protection
Effective Combination of Erosion and Sediment Control
Effective Combination of Erosion and Sediment Control
SC-1 Silt Fence, SS-6 Straw Mulch

Correct installation of silt fence on a slope stabilized with Straw Mulch

Straw Mulch application
Effective Combination of Erosion and Sediment Control
SC-1 Silt Fence, SC-5 Fiber Rolls, SS-3 Hydraulic Mulch
Effective Combination of Erosion and Sediment Control
SC-1 Silt Fence, SS-7 Erosion Control Blanket
Effective Combination of Erosion and Sediment Control
SC-1 Silt Fence, SS-6 Straw Mulch
## Tracking Control

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<td>Stabilized Construction Entrance/Exit</td>
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<td>TC-2</td>
<td>Stabilized Construction Roadway</td>
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<tr>
<td>TC-3</td>
<td>Entrance/Outlet Tire Wash</td>
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</table>
Inadequate Tracking Control

Lack of stabilized entrance/exit
Adequate Tracking Control

Large diameter rock used as a stabilized entrance/exit.
Inadequate Tracking Control

Stabilized entrance/exit on right gets little use vs. unstabilized area on left
Adequate Tracking Control

Possible solution: Block other entrance/exit
## Wind Erosion Control

<table>
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<tr>
<td>WE-1</td>
<td>Wind Erosion Control</td>
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Lack of wind erosion controls

Adequate dust control
## Non-Storm Water Management BMPs

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<tr>
<th>ID</th>
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<td>NS-1</td>
<td>Water Conservation Practices</td>
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<td>Dewatering Operations</td>
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<td>Paving and Grinding Operations</td>
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<td>Temporary Stream Crossing</td>
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<td>Clear Water Diversion</td>
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<td>NS-6</td>
<td>Illicit Connection / Illegal Discharge Detection and Reporting</td>
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<td>NS-7</td>
<td>Potable Water / Irrigation</td>
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<td>NS-8</td>
<td>Vehicle and Equipment Cleaning</td>
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<td>Vehicle and Equipment Maintenance</td>
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<td>NS-11</td>
<td>Pile Driving Operations</td>
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<td>NS-12</td>
<td>Concrete Curing</td>
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<td>NS-13</td>
<td>Material and Equipment Use over Water</td>
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<td>NS-14</td>
<td>Concrete Finishing</td>
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<td>NS-15</td>
<td>Structure Demolition/Removal Over or Adjacent</td>
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Adequate and Inadequate Non-Storm Water BMP Implementation

Mobile fueling operations require BMPs
Inadequate Non-Storm Water BMP Implementation

Prevent non-storm water discharges
Adequate and Inadequate Non-Storm Water BMP Implementation

Properly manage temporary stream crossings
Adequate Non-Storm Water BMP Implementation

Clear water diversion prevents off-site runoff from contacting construction site pollutants.
# Waste Management and Material Pollution Control BMPs

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<td>Material Use</td>
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<td>Stockpile Management</td>
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<td>WM-4</td>
<td>Spill Prevention and Control</td>
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<tr>
<td>WM-5</td>
<td>Solid Waste Management</td>
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<td>WM-6</td>
<td>Hazardous Waste Management</td>
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<td>WM-7</td>
<td>Contaminated Soil Management</td>
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<td>WM-8</td>
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<td>Sanitary / Septic Waste Management</td>
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<td>WM-10</td>
<td>Liquid Waste Management</td>
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Adequate and Inadequate Waste Management and Materials Pollution BMP Implementation

Well maintained temporary containment facility

Substances that require storage in a containment facility
Adequate Waste Management and Materials Pollution BMP Implementation

Proper spill control
Solid waste needs to be managed and properly disposed
Inadequate Waste Management and Materials Pollution BMP Implementation

Concrete washout

Uncontrolled concrete washouts
Dewatering Requirements
General Dewatering and Discharge Process

Collection or Storage of Water → Pump → Water Treatment → Discharge
Dewatering Management Options

- Retain water onsite
- Discharge to adjacent land or facility
- Discharge to public sanitary sewer system
- Treat and discharge to storm drain system
Sediment Treatment Options

- Desilting/Sediment Basin
- Weir Tanks
- Dewatering Tanks
- Filter Bags
- Sand Media Filter
- Cartridge and Pressurized Bag Filters
Sampling and Analysis
Modification to the General Construction Permit – adopted April 2001

- Implement specific sampling and analytical procedures to determine whether BMPs implemented are:
  - Preventing further impairment, from storm water discharge, of 303(d) listed water bodies for sedimentation/siltation or turbidity.
  - Preventing other non-visible pollutants from causing or contributing to exceedances of water quality objectives.

The Modification is Now included in the “02” Permit.
The requirements are intended to determine if BMPs implemented on the construction site are effective for preventing sediment/silt and other non-visible pollutants from impacting water quality objectives.
Types of Pollutants

Sediment/Silt and Turbidity

Non Visible Pollutants - Construction Materials
Sampling and Analysis Plan

**Applies:**

- To projects where construction activities result in 0.4 hectares (1 acre) or more of soil disturbance and when there will be a storm water discharge directly to a Water of the United States (e.g. USGS blue line) or to a storm sewer system that discharges into a Water of the United States.

- Water of the U.S. defined go to [www.epa.gov/region6/6en/w/watersus.htm](http://www.epa.gov/region6/6en/w/watersus.htm)
Sampling for Sedimentation/Siltation/Turbidity

- Project Discharges Directly into 303(d) Water Body
  - Identify sampling locations for monitoring discharges
    - Upstream of the project
    - Immediately down stream from last discharge point of the project
    - Run-on that enters the Caltrans right-of-way
  - Sampling must occur during the first two hours of discharge
    - During daylight hours – sunrise to sunset
    - Year round / seven days a week – including holidays
  - Sample a maximum of four events per month
    - Minimum 72 hours of dry weather between events
  - Samples collected by personnel trained in water quality sampling procedures
    - Contractors staff or Laboratory personnel
Sampling and Analysis required:
- Within two hours after discharge occurs, one of the following occurs:
  - Construction material, wastes, and activities are not stored under watertight conditions
  - Applicable BMPs are not properly implemented
  - The construction site historically was used as a site that may have had non-visible pollutants on it
  - Soil amendments or soil stabilizers have been previously applied

Sample Collection:
- First two hours of discharge
  - During daylight hours – sunrise to sunset
  - Seven days a week / year round including holidays
- Personnel trained in water quality sampling procedures
  - Contractors staff or laboratory personnel
- Sampling locations – per approved plan
  - Down gradient from discharge location, which drains the area of the observed breach, malfunction, leakage, spill, or suspected contamination
  - Uncontaminated up gradient background sample
Conditions that Don’t Require Sampling

- Sedimentation/Siltation/Turbidity (non-direct discharge) – SAP not required
  - Discharges that flow to tributaries of 303(d) waters that are not listed themselves as impaired
  - Discharges to Municipal Separate Storm Sewer Systems including Caltrans storm drainage system

- Non-Visible Pollutants
  - Spilled materials or waste are completely removed prior to a rain event
  - Materials and wastes are properly stored (in a watertight condition), disposed of or incorporated into the work prior to a rain event
# Caltrans Pollutant Testing Guidance Tables

<table>
<thead>
<tr>
<th>Cleaning Products</th>
<th>pH Acidity</th>
<th>Pollutant Testing Guidance Table</th>
<th>HACH pH Test Kit or pH Meter</th>
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<th>HACH Chlorine Test Kit</th>
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<th>EPA 150.1 (pH)</th>
<th>SM 2310B (Acidity)</th>
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Notes:

1. If specific pollutant is known, analyze only for that specific pollutant. See MSDS 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 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 aerial 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 no water quality sampling and analysis is not required: Super Tak™, M-Binder™, Fisch Stik™, Pro40dc™, Fisch-Bond™, and Soil Master WR™.