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March 20, 2010

CALIFORNIA ENERGY COMMISSION
Attn: Docket no. 08-AFC-9
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

Subject: **City of Palmdale Hybrid Power Project – Docket 08-AFC-9 Supplemental Comments on Volumes 1 and 2 of the PHPP Preliminary Staff Assessment**

Dear Sir/Madam:

Pursuant to California Code of Regulations, title 20, Sections 1209, 1209.5, and 1210, enclosed herewith for filing please find the City of Palmdale's Supplemental Comments on Volumes 1 and 2 of the Preliminary Staff Assessment for the Palmdale Hybrid Power Project.

Please note that the enclosed submittal was filed today via overnight and/or regular mail to your attention and to all parties on the attached proof of service list.

Sincerely,

Sara J. Head

Sara J. Head
Project Manager
sara.head@aecom.com

Enclosure

cc: 08-AFC-9 Proof of Service List via overnight and/or U.S. mail

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

In the Matter of:

City of Palmdale's Application for Certification of the Palmdale Hybrid Power Project	))))	Docket No. 08-AFC-9

CITY OF PALMDALE'S SUPPLEMENTAL COMMENTS ON VOLUMES 1 AND 2 OF THE PRELIMINARY STAFF ASSESSMENT FOR THE PALMDALE HYBRID POWER PROJECT

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March 20, 2010

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

In the Matter of:

City of Palmdale's	)	
Application for Certification of the	)	Docket No. 08-AFC-9
Palmdale Hybrid Power Project	)	
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CITY OF PALMDALE'S SUPPLEMENTAL COMMENTS ON VOLUMES 1 AND 2 OF THE PRELIMINARY STAFF ASSESSMENT FOR THE PALMDALE HYBRID POWER PROJECT

I. INTRODUCTION

Volume 1 of the Palmdale Hybrid Power Project (PHPP) Preliminary Staff Assessment (PSA) was issued on December 23, 2009 and Volume 2 was issued on February 9, 2010 by the California Energy Commission (CEC). The Applicant provided a preliminary set of comments on the Volume 1 PSA to the CEC on February 8, 2010 and on Volume 2 of the PSA on March 8, 2010. A Workshop was held to discuss the PSA (Volumes 1 and 2) on February 11, 2010 and another Workshop focusing on Biological Resources issues was held on March 16, 2010.

As a result of discussions at the Workshops and additional information becoming available, supplemental comments are being provided herein on Volume 1 of the PSA on topics including Hazardous Materials, Paleontological Resources and Transmission System Engineering (TSE). During the February 11 Workshop, Staff agreed with many of the changes requested by the Applicant related to Volume 1 of the PSA. In a couple of cases (i.e., HAZ-10 and PAL-4), Staff agreed that slightly different wording to the conditions of certification would be acceptable, and in those cases, revised versions are provided in Section II, below. This submittal also includes supplemental information pertaining to TSE based on communications with Southern California Edison (SCE).

Supplemental comments on Volume 2 of the PSA are also being provided in this submittal. Topics include Biological Resources, Cultural Resources, Land Use, Soil & Water Resources, Traffic & Transportation, and Visual Resources. This submittal also addresses some of the other items from PSA comment letters that were submitted to the CEC by March 8, 2010. As in our previous two PSA comment submittals, for comments dealing with Conditions of Certification, we first provide our comment and then our proposed revisions in strikeout or underline format.

II. ADDITIONAL COMMENTS ON THE PSA VOLUME 1

A. HAZARDOUS MATERIALS

Comments were provided on condition HAZ-9 on February 8, 2010 and discussed at the February 11, 2010 Workshop. CEC Staff indicated acceptance of requested changes as shown in items 1 and 8 below. However, Staff indicated that comments on item 10 of this condition required further revision to be acceptable. Applicant still believes that if a security guard is present on-site, it is not necessary to have cameras or breach detectors around the power block as well as the solar field for a relatively small (333 acre) facility that does not have significant quantities of hazardous materials (e.g., ammonia). Furthermore, in discussions between the City and Plant 42, it has been determined that the Air Force would prefer that CCTV not be used around the fences that border Plant 42. Revised proposed language is provided below.

HAZ-9 The project owner shall prepare a site-specific Security Plan for the operational phase and shall be made available to the CPM for review and approval. The project owner shall implement site security measures addressing physical site security and hazardous materials storage. The level of security to be implemented shall not be less than that described as below (as per NERC 2002).

The Operation Security Plan shall include the following:

1. Permanent full perimeter fence or wall, at least eight feet high around the Power Block and Solar Field <u>and meet the requirements</u> ~~and extend below ground surface consistent with the Desert Tortoise exclusion fencing requirements~~ specified in Condition of Certification **BIO-11**.
2. Main entrance security gate, either hand operable or motorized;
3. Evacuation procedures;
4. Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency;
5. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;
6.
    a. A statement (refer to sample, attachment “A”) signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to ascertain the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy;

b. A statement(s) (refer to sample, attachment "B") signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner) that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractor personnel that visit the project site.

7. Site access controls for employees, contractors, vendors, and visitors;
8. A statement(s) (refer to sample, attachment "C") signed by the owners or authorized representative of ~~hazardous materials~~ aqueous ammonia transport vendors certifying that they have prepared and implemented security plans in conformity with 49 CFR 172.880, and that they have conducted employee background investigations in accordance with 49 CFR Part 1572, subparts A and B;
9. Closed Circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) capable of viewing~~, at a minimum,~~ the main entrance gate and the ammonia storage tank (but angled so as not to record any activity at Air Force Plant 42); and
10. Additional measures to ensure adequate perimeter security consisting of either:
    a. Security guard present 24 hours per day, seven days per week, **OR**
    ~~b.~~ Power plant personnel on-site 24 hours per day, seven days per week and ~~**all** of the following:~~
    ~~**1)** The CCTV monitoring system required in number 9 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have lowlight capability, are recordable, and are able to view 100% of the power block perimeter fence, the ammonia storage tank, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **AND**~~
    ~~2) Power block perimeter breach detectors **or** on-site motion detectors.~~
    ~~3)~~ The northern and western ~~entire~~ perimeter fence around the solar array shall ~~be viewable by the CCTV system **or**~~ have perimeter breach detectors **or** on-site motion detectors.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to the security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power plant components (e.g., transformers, gas lines, compressors, etc.) depending on circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North

American Electrical Reliability Council, after consultation with appropriate law enforcement agencies and the applicant.

Verification: At least 30 days prior to the initial receipt of hazardous materials onsite, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the Annual Compliance Report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

B. PALEONTOLOGY

Applicant submitted comments on PAL-4 on February 8, 2010 and discussed the requested changes at the PSA Workshop. CEC Staff indicated that additional changes are needed; The issue revolves around having to produce a video for CPM approval prior to the start of training, since often the video is filmed during the initial training exercise. Instead, Applicant seeks to have the script and/or training materials approved in advance, but not the actual video. Applicant provides the following revised version.

PAL-4 Prior to ground disturbance and for the duration of construction activities involving ground disturbance, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for the following workers: project managers, construction supervisors, foremen, and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in sensitive units prior to receiving CPM-approved worker training. Worker training shall consist of ~~a CPM-approved video or in-person presentation~~ training based on a CPM-approved video script or other presentation materials. Following initial training, a CPM-approved video, other approved training presentation, or in-person training may be used for new employees. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. No ground disturbance shall occur prior to CPM approval of the Worker Environmental Awareness Program (WEAP), unless specifically approved by the CPM.

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources.

The training shall include:

1. A discussion of applicable laws and penalties under the law;
2. Good quality photographs or physical examples of vertebrate fossils for project sites containing units of high paleontological sensitivity;
3. Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;
4. Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;
5. An informational brochure that identifies reporting procedures in the event of a discovery;
6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training; and
7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification:

(1) At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP, including the brochure, with the set of reporting procedures for workers to follow.

(2) At least 30 days prior to ground disturbance, the project owner shall submit the training program presentation/materials ~~script and final video~~ to the CPM for approval if the project owner is planning to use a presentation format other than a video for ~~a video~~ for interim training or a script if a video is to be used for training.

(3) If the owner requests an alternate paleontological trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct training prior to CPM authorization.

(4) In the monthly compliance report (MCR), the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained and the trainer or type of training (in-person or other approved presentation format ~~video~~) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

C. TRANSMISSION SYSTEM ENGINEERING

1. California Department of Water Resources (CDWR)

The Applicant's comments submitted on February 8, 2010 included a proposed condition of certification to ensure the reliability of the Pearblossom Pumping Plant is not significantly impaired. A revised version of the condition is provided below that addresses comments raised by Staff at the PSA Workshop:

Proposed Condition of Certification: Following consultation with Southern California Edison, Applicant shall provide Staff with a draft mitigation plan to ensure the

Pearblossom Pumping Plant would not be significantly impacted by the construction or operation of the PHPP transmission line located within the Southern California Edison right-of-way (Segment 2) (the "Pearblossom Pumping Plant Mitigation Plan"). Applicant shall concurrently provide a copy of the Pearblossom Pumping Plant Mitigation Plan to the California Department of Water Resources, which may provide comments to Staff and Applicant within thirty (30) days. Applicant shall have an opportunity to respond to any comments by the California Department of Water Resources. Within thirty (30) days following the receipt of any comments by the California Department of Water Resources, Staff shall approve the final Pearblossom Pumping Plant Mitigation Plan.

Proposed Verification: Applicant shall provide the CPM a copy of the approved Pearblossom Pumping Plant Mitigation Plan thirty (30) days prior to beginning construction of any portion of the transmission line in the Southern California Edison right-of-way (Segment 2).

2. Southern California Edison (SCE) Comments

Based on discussions with SCE, we provide the following clarifications related to the proposed transmission line:

- SCE points out that the design for the Segment 2 (the 12-mile segment from Pearblossom to Vincent) transmission line has not been finalized and will not be finalized until the detailed ROW study is performed after the CEC Certificate to Construct is issued; therefore, the design shown in the PSA is subject to modification.
- SCE points out that only Segment 2 will be owned by SCE and it does not anticipate transferring ownership of the segment; furthermore it notes that, since SCE does not anticipate owning Segment 1, any reference to transfer of ownership of Segment 1 to SCE is inappropriate at this time.
- SCE further clarifies that language currently in the PSA is confusing regarding how Segment 2 will be designed and owned; as noted earlier, regardless of final design, SCE will own all of this 12-mile segment; both the circuits that serve CDWR and the circuits that serve PHPP.
- With regard to providing uninterrupted service to CDWR during construction, SCE anticipates minimizing outages to CDWR, but cannot confirm at this time that they will be entirely avoided or eliminated altogether. The Applicant's proposed CDWR Permit Condition (see item 1, above) further addresses this point.

Note, some minor changes to the Executive Summary and the Project Description of the PSA will be needed relative to the above comments.

3. Los Angeles County Parks and Recreation Trail Easement

A PSA comment letter dated February 25, 2010 was submitted by the Los Angeles County Parks and Recreation Department. This letter contained a request that a minimum 12-foot wide trail easement be maintained in the utility corridor from the western edge of parcel #AIN39011005 to the eastern edge of parcel #AIN3039006021. This trail easement is located along the transmission line route, along E Avenue S between 110th Street and 126th Street. The Applicant expects to be able to accommodate this request from the County.

III. ADDITIONAL COMMENTS ON THE PSA VOLUME 2

A. BIOLOGICAL RESOURCES

The CEC Staff member who prepared the Biological Resources section of the PSA was not able to attend the February 11, 2010 PSA Workshop. Because Staff was not available for this Workshop, it was agreed that a follow-up workshop would be scheduled. This follow-up Workshop was held on March 16, 2010.

The following action items were agreed to at the March 16 Workshop:

- Both the CEC Staff and the Applicant will provide a revised set of Conditions of Certification based on changes agreed to and under consideration
- The Applicant will provide revised vegetation mapping to further distinguish the habitat types of most concern
- The Applicant will provide maps (under confidential cover) of additional areas to be considered for potential compensation lands

B. CULTURAL RESOURCES

The PSA identified five items where additional cultural resources information was requested. Two of the items, i.e., the use of an on-site Land Treatment Unit and the source of fill for the Earthen Berm were completely addressed in the Applicant's March 8, 2010 comments. In addition, a confidential filing was made on March 16, 2010 which provided the specific location of the five additional known archaeological sites in relation to the survey corridors to demonstrate that the PHPP would not impact these sites. The remaining two items pertaining to the Palmdale ditch and Southern Pacific/Union Pacific railroad berm are discussed below:

1. Palmdale Ditch

On April 28, 2009, Staff provided informal data requests related to the location of the transmission line poles and access roads in the vicinity of the Palmdale Ditch. On May 15, 2009, the Applicant provided a response that included two diagrams showing the location of the nearest transmission pole to the Palmdale Ditch, tunnel mouth, and bridge.

During the PSA Workshop, CEC Staff indicated that they would provide further input on the information needed to be included on the diagrams. A memo was provided to the Applicant from Beverly Bastian of the CEC on March 17, 2010 that indicated the information provided in May 2009 was sufficient and no additional information was needed for the FSA. Although the previous diagrams were adequate, a more detailed Palmdale Ditch transmission pole location diagram is provided in Attachment CR-1, entitled “Palmdale Ditch Poles 68 and 69 Locations,” with this response.

2. Southern Pacific/Union Pacific Railroad Berm

Staff indicated that the PHPP could impact the historic Southern Pacific/Union Pacific Railroad (SP/UP) railroad berm in two places: a) where the natural gas and reclaimed water pipelines that will be installed parallel to the railroad right-of-way (ROW) and Sierra Highway from Lockheed Way to E Avenue M cross into this corridor; and b) near one of the pole locations along Segment 1 of the transmission line route. As we describe below, the project is designed to avoid any potentially significant impacts to these resources.

a) The two pipelines (natural gas and reclaimed water) will be constructed either underneath the centerline or near the eastern edge of Sierra Highway, approximately 50 to 75 feet away from the SPRR railroad berm. The two pipelines will cross the historic railroad ROW at both Lockheed Way on the south and E Avenue M on the north as the pipelines cross into the Sierra Highway corridor. A diagram showing the proposed pipeline locations in relation to the railroad ROW and berm is included in Cultural Resources Attachment CR-1.

   On July 22, 2009, a copy of a letter to CDFG from AMEC dated July 10, 2009 was docketed with the CEC. This letter contained an explanation and diagrams to demonstrate how the project owner plans to employ horizontal drilling (i.e., jack and bore) techniques to drill under State jurisdictional washes and avoid impacts. The same methodology will be used to bore under the railroad and railroad berm at crossings to avoid impacts to these features as well.

b) The transmission line pole location along Segment 1 that is of concern to the CEC Staff is located adjacent to the railroad spur that runs east from the historic SP/UP railroad. The spur is not historic, as we have already demonstrated in our previous submittal to the CEC on May 15, 2009. With respect to Staff’s concern that the transmission line pole may have an impact on the railroad spur, the Applicant has prepared a figure, provided in Attachment CR-1, entitled “SPRR Palmdale to Colton Spur PHPP Pole Locations” which illustrates that the nearest pole (# 183) is located a sufficient distance away from the railroad berm (i.e., approximately 150 feet) such that there will be no impact. In terms of potential impacts from the transmission line, the pole locations are flexible to some extent. It is the Applicant’s understanding, based on discussions with its consultant team, that the poles can be placed to avoid impacts to the railroad.

C. LAND USE

1. Comments on Transmission Line Land Use Consistency Determination

In the PSA, Staff requested additional feedback from the City of Palmdale or the County of Los Angeles regarding the zoning consistency analysis with respect to the transmission line route. Accordingly, a letter prepared by the City of Palmdale which addresses this request is provided in Attachment LU-1. In addition, the Los Angeles County Department of Regional Planning submitted a PSA comment letter dated February 25, 2010 that established the consistency of the PHPP transmission line with the Los Angeles County Zoning Ordinance.

2. Comments on Entry Point of the PHPP Natural Gas Pipeline

The PSA Land Use Section requested information about the entry point of natural gas pipeline onto the power block. As indicated in Applicant's revised conceptual site layout docketed on March 2, 2009 (PHPP Supplemental Responses to CEC Data Request Set 1), the natural gas pipeline point of entry is the west side of the Project site to allow The Gas Company better access to the metering station without having to enter the restricted areas of the site.

D. SOIL AND WATER RESOURCES

1. Draft Construction Storm Water Pollution Prevention Plan (SWPPP)

CEC Staff have indicated that they will require a draft construction SWPPP prior to issuance of the Final Staff Assessment (FSA). The Applicant has completed its draft construction SWPPP, a copy of which is provided in the Soil and Water Resources Attachment S&W-1.

2. Additional Plant Screening Berm Details

In the PSA, CEC Staff indicated additional information is needed related to soil volume, soil compaction, and the Best Management Practices (BMPs) for the landscaped berm proposed along East Avenue M. The Applicant has had discussions with Air Force Plant 42 regarding the portion of the PHPP screening berm that is planned to run a short distance (approximately 250 feet) in a north-south alignment along 15th Street E between PHPP and Air Force Plant 42, and has provided an updated conceptual site plan for their review (see Attachment S&W-2). As stated at the March 16 Workshop, the Air Force is reviewing this plan.

The additional detail regarding the revised berm (including the additional 250 foot section along 15th Street East) is provided as follows:

The total length of the berm (designed to restrict the view of the solar arrays from the point of view of Avenue M) is approximately 3,300-feet. The height of the berm is eight-feet and the top width is ten-feet across. The bottom width is 58 feet across. The berm is designed at a 3:1 slope. There is ample fill available onsite to construct the berm; requiring 897,600 cubic feet or 33,244 cubic yards of soil (or the equivalent of 23.7 acre-feet employing a 15% compaction factor). Per the conceptual grading plan design, the available or excess cut from site is 128 acre-feet. Thus no additional cut is required for the berm, other than removing and setting aside the topsoil for later use. As shown on the attached profile view, the berm requires fill on the existing grade. The berm profile (SKC-2007-021-CM-501) and conceptual layout (SKC-2007-021-CM-500) are provided in the Soil & Water Resources Attachment S&W-2.

Information on proposed BMPs for the berm was previously provided to the CEC as part of our March 8, 2010 PSA comment submittal and are also provided in Attachment S&W-1 draft construction SWPPP (see Wind Erosion Control section 4.8.8 and Appendix WE-1).

3. Recycled Water Project Agreement

The Recycled Water Project Agreement between the Applicant and the Los Angeles County Waterworks Board for the long-term supply (30 years) of tertiary-treated water for the PHPP has been approved and signed by the Board of Waterworks and the Palmdale City Council. The agreement specifies all terms, conditions, and projected costs for the delivery and use of recycled water to the PHPP. As requested by the CEC at the Workshop, a copy of the Recycled Water Project Agreement is provided in Soil and Water Resources Attachment S&W-3.

4. Reclaimed Water Adjudication Letters from AVUMG and AVGAA

On March 8, 2010, PSA comment letters were submitted to the CEC by the Antelope Valley United Mutual Group (AVUMG) and the Antelope Valley Groundwater Agreement Association (AVGAA) related to PHPP's proposed use of reclaimed water. The Applicant will provide the CEC with a response to these letters in the next few weeks.

E. TRAFFIC AND TRANSPORTATION

The Summary of Conclusions in the Traffic and Transportation section of the PSA indicated that Staff requires additional information related to traffic in Lancaster and also additional information regarding the potential for impacts of thermal and visual plumes on Air Force Plant 42 operations.

1. Comments on Lancaster and Palmdale PHPP Traffic Issues

The following general comments pertaining to the Traffic and Transportation section are provided relative to the discussions held at the CEC PSA Workshop on February 11, 2010:

a. Compliance with Access, Circulation, and Parking Requirements

At the CEC Workshop, Staff discussed whether or not the PHPP complied with applicable requirements related to site access, circulation, and parking. These features are shown in conceptual site layout docketed by the Applicant in March 2, 2009. The

Applicant and the CEC agreed that compliance with TRANS-8 and TRANS-9 was the appropriate mechanism for satisfying these concerns.

b. Intersection at Lancaster 10th Street East and Avenue L

Applicant confirmed with CEC Staff that the analysis had been re-run assuming a signalized intersection, and that there are no significant impacts. Based upon peak hour traffic counts completed in 2008, the intersection currently operates at an LOS B during both the morning and evening weekday peak commute period. Assuming a worst case potential increase in traffic of 5.59 percent per year consistent with trends on the Antelope Valley Freeway, the intersection is forecast to continue to operate at LOS B during the morning and evening peak commute periods in 2011 without the proposed project. Adding estimates of peak construction traffic to the projected traffic total, is forecast to result in the intersection operating at an LOS B during the morning and LOS C during the evening weekday peak periods.

c. Potential Traffic Impacts in City of Lancaster

The PSA indicates additional information is needed for traffic impacts on E. Avenue M and a determination of impacts to a few intersections in Lancaster. The Applicant's traffic consultant analyzed potential impacts if E. Avenue M were used to access the site during peak construction traffic and determined that improvements would be needed if that route were used. Therefore, use of E. Avenue M as the main route to the PHPP site was dropped from consideration by the Applicant for the AFC. However, as noted below, the Applicant (City of Palmdale) has had subsequent discussions with the City of Lancaster related to the route to be used.

Further traffic counts and LOS analyses to identify potential impacts to additional intersections along Avenue L at 10th Street West and Business Center Parkway has shown the intersection at 10th Street West currently operating at an LOS B in the morning and LOS C in the evening weekday peak commute. The intersection of Business Center Parkway with Avenue L is operating at an LOS B during both the morning and evening peak commute periods. Assuming a worst case potential increase in traffic of 5.59 percent per year consistent with trends on the Antelope Valley Freeway as described above, both intersections are forecast to continue operating at an existing LOS during the morning and evening peak commute periods in 2011 without the proposed project. Adding estimates of peak construction traffic to this projected total along the presumed route is forecast to result in the intersection of 10th Street West deteriorating from LOS C to LOS D during the evening peak commute and the intersection of Business Center Parkway deteriorating from LOS B to LOS C during the evening peak commute. The City of Lancaster's criteria for the determination of an impact is if a project causes an existing LOS D or better to deteriorate to below LOS D, E or F. Therefore, significant impacts are not forecast to occur at these locations. Furthermore, these worst case traffic volumes are temporary as they only occur during the construction period.

In terms of the capacity of 10th Street East, intersections along a segment of roadway typically set the corridor capacity. In this case, Project traffic would be using the segment between E. Avenue L and Columbia Way or E. Avenue M. The intersections at both ends (10th Street with Avenue L and Columbia Way) were evaluated as part of the project traffic analysis and are forecast to operate acceptably or at an LOS D or better assuming the intersection of Columbia and 10th Street East/Project entrance is signalized as proposed.

Detailed traffic count and LOS calculation data for the above analyses are included in the Traffic and Transportation Attachment T&T-1, Traffic Counts and Level of Service Calculations.

2. Comments on TRANS-1, Lancaster/Palmdale Traffic Control Plan

The City of Palmdale is currently in discussions with Lancaster on key elements of the Traffic Control Plan and implementation program. The staffs of the two cities have met, and are in the process of reaching an agreement on how to address broader issues of mutual concern. The Applicant will continue to work with the City of Lancaster to address any project-related traffic concerns. In order to provide flexibility in determining acceptable routes for construction traffic to minimize impacts by PHPP, the Applicant proposes the following revisions to TRANS-1:

TRANS-1 The project owner shall submit to the cities of Palmdale and Lancaster a construction traffic control plan and implementation program. The traffic control plan must be prepared in accordance with Caltrans Manual on Uniform Traffic Control Devices and the WATCH Manual and must include but not be limited to the following issues:

- Prepare and distribute a map ~~of~~ indicating the route for construction workers to use to access the proposed project site. ~~(SR-14 to east on Avenue L to south on 10th Street East).~~
- Establish a TDM program in conjunction with AVTA and the cities of Palmdale and Lancaster.
- Limit heavy equipment and building materials deliveries to between 9:30am and 3:30pm, per Palmdale Circulation Element policy, to minimize impacts (Policy C.1.7.3) and route truck traffic around residential development (Policy C.1.7.2).
- Provide signing, lighting, and traffic control device placement during construction impacting regional and local roadways;

- Alternate construction work hours and arrival/departure times outside peak traffic periods;
- Traffic diversion plans (in coordination with the cities of Palmdale and Lancaster) to ensure access during temporary lane/road closures;
- Ensure ~~of~~ access for emergency vehicles to the project site;
- Temporary closure of travel lanes or disruptions to street segments and intersections during reconductoring activities or any other utility tie- ins;
- Establish a parking plan for workers, construction vehicles, and trucks during transmission line and pipeline construction.
- Installation of the natural gas pipeline and water line to occur during non-peak hours.
- Use flagging, flag men, signage and cover open trenches.

Verification: At least 90 day prior to the start of site mobilization, the project owner shall submit a traffic control plan that outlines each component above to the cities of Palmdale and Lancaster for review and comment and submit the construction traffic control plan to the Compliance Project Manager (CPM) and Chief Building Official (CBO) for review. The CPM and CBO will consider comments received by the cities and include such comments where appropriate.

3 Comments on the PHPP Vertical Velocity Plume Hazard Potential

In the February 11, 2010 Workshop, the Staff described their vertical velocity plume potential hazard analysis as a conservative analysis.

Applicant has identified the following four potential discrepancies between Staff's analysis in the PSA and Applicant's analysis in the AFC:

a) The Staff's analysis appears to overestimate the frequency of calm winds at the Plant 42 Airfield by approximately a factor of five. The Staff estimate of the calm frequency of 10 percent is based on the meteorological data for the three year period 2002-2004 measured at the Airfield by the National Oceanic and Atmospheric Administration as part of the Automated Surface Observation System (ASOS). The starting threshold for an ASOS anemometer is 2 knots with a minimum reporting speed of 3 knots. Therefore, the 10 percent value reflects not the occurrence of calm winds but rather the occurrence of wind speeds less than 3 knots. By comparison, the wind sensor at the nearby General Fox Field in Lancaster has a five-year frequency of winds less than 1 knot of 2.2 percent. On a daylight basis, there are on average less than 73 daylight hours per year at General Fox Field with winds less than 1 knot. These daylight hour, very low speed or calm winds occur mainly during the hours just after sunrise.

b) The Staff vertical velocity modeling is based on the assumption that a stable or neutral boundary layer can extend up to 1,000 feet above the ground at the time aircraft can potentially be impacted by plume turbulence. For the desert location where the Airfield is located, this is not a representative assumption, particularly during the daytime when strong solar heating produces significant convection in the desert year-round. For calm winds to persist through a deep surface boundary layer, there must be a strong high pressure system stagnating over the area that allows a large area of low winds to form through a deep neutral boundary layer. During winter, such conditions can occur beneath a large, cold arctic air mass. These conditions do not occur in southern California.

   A warm stagnating high pressure system with resultant clear skies can also produce a deep neutral boundary layer. However, the desert environment surrounding the Airfield tends to counteract the formation of a near neutral boundary layer. When the winds are light, clear skies during the day will allow intense daytime convection to occur due to solar heating, particularly during the warm summer months. However, the movement of such a high pressure system in Southern California in the non-summer months is typically associated with strong northwest winds known as Santa Ana winds.

   During non-Santa Ana conditions, a stable boundary layer can form at night below the surface inversion resulting in calm winds at the surface in a shallow layer. However, the inversion is short-lived once the sun comes up due to the surface heating under the clear skies and the resultant strong thermal convection. Best, et al.[1] state that the magnitude of vertical velocities in such convection can reach 8 meters per second, nearly double the significance criteria of 4.3 meter per second defined by the Staff for assessment of vertical velocity impacts.

   The only time when there is a reasonable expectation that a deep stable or neutral boundary layer could form near the Airfield is at night under a stagnating winter high pressure system. However, at night aircraft from the Airfield will be operating under instrument flight rules (if at all) and are unlikely to be vectored over the PHPP plumes. Therefore, the probability that an aircraft could experience significant turbulence above the PHPP facility under calm wind conditions up to 990 feet does not appear credible, given the low frequency of near calm and calm winds in the vicinity of the Airfield, the majority occurrence of calm winds at night, and the low probability that aircraft would fly near the stacks under conditions conducive to calm wind formation. The most certain means to prevent potential turbulence effects above the PHPP power block is to issue a Notice to Airmen (NOTAM) recommending avoidance of the power plant area.

[1] Best, et al., 2003. "Aviation Safety and Buoyant Plumes", Clean Air Conference, Newcastle, New South Wales, Australia.

c) The Staff modeling to estimate plume vertical velocity of the PHPP plume was performed assuming calm winds using the Best, et al., model, as implemented by Keystone Environmental for the Russell City Energy Center [2]. As discussed above, daytime winds less than 1 knot occur on average less than 73 hours per year (0.9 percent of daylight hours) in the vicinity of the Airfield. Applicant believes a more reasonable lower limit wind speed for the vertical plume analysis is a 99th percentile lower wind speed (i.e., 99 percent of wind speeds are greater), which is a 1 knot wind based on the General Fox Field meteorological data. The Best model is valid for plume rise in a stable or neutral boundary layer. As discussed above, the occurrence of a deep stable or neutral boundary layer in southern California that can allow calm wind to persist up to 1,000 feet above the ground will be a rare event, and if it does occur, will most likely occur at night. Therefore, the Staff used what appears to be an overly conservative assumption of calm winds in its modeling analysis. Such conditions would be highly unlikely to extend up to 1,000 feet.

d) The Staff uses as a criterion a plume average vertical speed of 4.3 meters per second to assess potential impacts due to plume turbulence. Best, et al., note that the 4.3 meter per second criteria reflects a plume average vertical velocity, and not an instantaneous centerline velocity. This threshold speed is defined by the Australian Civil Aviation Safety Authority (CASA) as a threshold for potential hazards to civil aviation.[3] However, the Advisory Circular defines an altitude of 360 feet above ground level, or the height of the Obstacle Limitation Surface (OLS), as the height below which plume turbulence vertical velocities could be a hazard to civil aviation. The CASA threshold height is approximately one third of the height stated by Staff as the height at which the threshold vertical velocity could occur over the PHPP.

   The Applicant's assessment above demonstrates that a more representative conservative assumption for estimating the height of plume rise subject to a turbulence vertical velocity of the 4.3 meter per second criteria is a low, but non-zero wind speed. A reasonable conservative value for a wind speed for such an analysis is the 99th percentile wind speed (i.e., 99 percent of the observed speeds are greater than the chosen value, regardless of time of day). For the General Fox Field meteorological data, this speed is 1 knot.

In summary, based on the very conservative nature of the CEC analysis, the potential risk to aviation by over flights of the PHPP facility is significantly overstated due to the factors listed below:

---

[2] Katestone Environmental Pty, Ltd., 2007. "Plume Vertical Velocity Assessment of a Proposed Gas-Fired Power Station at Russell City Energy Center".

[3] Australian Civil Aviation Safety Authority, 2003. Advisory Circular AC 139-05(0) Guidelines for Plume Rise Assessment, October.

- General aviation is typically excluded from the Airfield,
- Military and commercial aircraft, because of their weight and power, are at minimal risk from the potential turbulence produced by thermal plumes.
- A Notice to Airmen (NOTAM) is likely to be issued recommending avoidance of the airspace over the PHPP.
- The frequency of calm winds at the Airfield are significantly lower than assumed by the CEC,
- The most plausible time conducive to the formation of a deep neutral or stable boundary layer of calm winds at the Airfield would be at night, a time where aircraft will be under instrument flight rules and therefore unlikely to be vectored over the PHPP.
- Daytime heating by solar insolation will in general prevent and/or limit the formation of a deep layer of calm winds at the Airfield during the day.
- The magnitude of any turbulence produced by the PHPP facility will likely be less than that of normal daytime convective turbulence in the desert environment in which the Airfield is located.

In conclusion, there is expected to be minimal risk to aircraft safety from thermal vertical plumes produced due to operation of the PHPP.

4 Comments on the PHPP Cooling Tower Visible Plume Analysis

The results of the Applicant's visible plume analysis presented in the PHPP AFC were significantly different than the results derived by Staff as presented in the PSA. The two visible plume analyses used different models and different meteorological data, i.e., the Applicant used the SACTI and VIZDET models with meteorological data from Air Force Plant 42 while Staff used the CSVP model with meteorological data from Victorville. As noted above in the discussion of thermal plumes, the Air Force Plant 42 meteorological data indicates too high of an occurrence of calm winds, which would overestimate plume size in a model like CSVP, and hence we agree with the use of the meteorological data chosen by Staff.

The SACTI model is a well known, EPRI-developed model for evaluating cooling tower plumes. It can be used to estimate ground fogging and deposition. The CSVP model provides hourly results and plume dimension data that are used by Staff in their analysis. However, the CSVP model is very sensitive to some input parameters, i.e., small changes to the moisture variable can produce large differences in the results.

In our investigation of the differences in the two methodologies, the Applicant conducted additional engineering review of the heat dissipation requirements for the proposed conventional counter flow cooling tower and concluded that revision of the design parameters was necessary. Therefore, updated information for the cooling tower was obtained from a tower vendor and was provided to the CEC Staff consultant for use in updating the analysis contained in the PSA. The revised cooling tower information is provided below.

Updated Mechanical Draft (Wet) Tower (Model F488-5.3-10B) Information

Gate Cycle Heat Balance Model:	**Design***	**Case PB4**	**Case PB19**	**Case PB8**	**Case PB13**	**Case PB6**	**Case PB11**	**Case PB9**	**Case PB14**
Ambient Temperature, Dry Bulb	98 °F	98 °F	98 °F	64 °F	64 °F	23 °F	23 °F	98 °F	98 °F
Relative Humidity	17%	17%	17%	40%	40%	92%	92%	17%	17%
Duct Burner Status	DB Unfired	DB Unfired	DB Fired	DB Unfired	DB Fired	DB Unfired	DB Fired	DB Unfired	DB Fired
Solar Heating Status	Solar OFF	Solar OFF	Solar OFF	Solar ON	Solar ON	Solar ON	Solar ON	Solar ON	Solar ON
HB Circulating water flow, gpm	120,200	120,200	120,200	120,200	120,200	120,200	120,200	120,200	120,200
HB Cooling Tower Range, F°	18.32	18.32	26.62	25.48	27.73	25.9	28.11	25.29	27.58
HB Ambient WB (no recirc. allow.), °F	71.09*	65.9*	65.9	51.0	51.0	22.4	22.4	65.9	65.9
Moist Air Mass Flow Rate (lb/min)	83449.7	83973.9	83316.4	84649.6	84465.9	86835.5	86585.0	83243.5	83261.6
WBout (F)	90.5	87.2	94.4	86.6	88.7	73.4	76.1	93.3	95.1
DBout (F)	90.5	87.2	94.4	86.6	88.7	73.4	76.1	93.3	95.1
Heat Rejection (MMBtu/hr)	1091	1093	1585	1520	1653	1549	1680	1506	1642
Dry Air Mass Flow Rate (lb/min)	80620.0	81417.4	80119.6	82112.3	81759.6	85166.3	84754.3	80330.8	79990.0

*The Design Case used values from Case PB4, except KPE directed SPX to use 71.09 °F for the Design Ambient Wet Bulb (which included tower recirculation) to size the Cooling Tower.

Original Three Cases:

- Design* based on Case PB4 except for WB, is for the Cooling Tower Design Conditions, 98 °F DB day with 17% RH, 2 CT's @ 100%, 1 STG @ 100%, unfired duct burners and no solar contribution
- Case PB8 is for the same Cooling Tower, Operating with the "Average Day" conditions: 64°F DB day with 40% RH, and has Unfired Duct Burners
- Case PB13 is for the same Cooling Tower, Operating with the "Average Day" conditions: 64°F DB day with 40% RH, and has Fired Duct Burners

Additional Six Cases:

- Case PB4 is for the Cooling Tower Design Conditions, 98 °F DB day with 17% RH, 2 CT's @ 100%, 1 STG @ 100%, unfired duct burners and no solar contribution
- Case PB19 is for the same Cooling Tower, Operating with the "Design Day" conditions: 98°F DB day with 17% RH, with No Solar but has Fired Duct Burners
- Case PB6 is for the same Cooling Tower, Operating with the "Cold Day" conditions: 23°F DB day with 92% RH, and has Unfired Duct Burners
- Case PB11 is for the same Cooling Tower, Operating with the "Cold Day" conditions: 23°F DB day with 92% RH, and has Fired Duct Burners
- Case PB9 is for the same Cooling Tower, Operating with the "Hot Day" conditions: 98°F DB day with 17% RH, and has Unfired Duct Burners
- Case PB14 is for the same Cooling Tower, Operating with the "Hot Day" conditions: 98°F DB day with 17% RH, and has Fired Duct Burners

On March 18, 2010 the Applicant's consultant met with the CEC's consultant to discuss the modeling approach and review the CSVP results based on the revised cooling tower data. While we continue to believe that the results of the frequency and size of visible plume from PHPP seem to be over stated for a desert climate, we agree with the CEC's consultant's development of the CSVP model input data and model execution. We also note that the analysis rightly assumes that the power plant will operate all hours of the night and day, and in all seasons, however actual operation is likely to be less, especially during the wintertime when visible plumes would be most likely to occur. Although some refinement of the analysis may be possible with further review of the cooling tower data, the Applicant is willing to accept these results.

In our review of the visible plume modeling and based on discussions held during the March 18 meeting, we note the following:

- Visible plumes are most likely to occur in cold temperature conditions, at night or early mornings, when relative humidity is high;
- The wind flow at the PHPP site is very predominantly from southwest quadrants, so visible plumes that may form will only infrequently be transported toward the Airfield. When they are blown in that direction, they will generally dissipate before reaching the runways; and
- The occurrence of ground fogging on E. Avenue M due to PHPP is not expected.

F. VISUAL RESOURCES

1. Visible Plume Simulation

During the PSA Workshops, Staff indicated that an additional simulation may be needed that shows what potential visible water vapor plumes could look like from the PHPP. As noted above for Traffic and Transportation, the Applicant recently obtained additional cooling tower information and provided it to the CEC to update Staff's visible plume analyses. As we expect updated analyses based on these data to be similar to the results in the PSA, we used the results from PSA Appendix VR-3 for the visible plume simulation.

The revised simulation is based on a view of the power plant from the west of the facility from the west side of the railroad tracks along Sierra Highway looking east. As discussed in the March 16, 2010 Workshop, this view is from KOP (Key Observation Point) 2 in the AFC. The simulation is based on a 20% plume from Table 3 in PSA Appendix VR-3, i.e., a size that could occur 20% of the time in the given meteorological conditions. The simulation is provided in Attachment VR-1, PHPP Cooling Tower Plume Simulation.

2. Air Force Plant 42 Concurrence of the Proposed Berm Location

As noted above in the Soil & Water Resources comments section, the Applicant has been in discussions with Plant 42 regarding concerns they may have regarding the berm that will be used to screen the solar array from motorists along E Avenue M that is proposed to go approximately

250 feet south along Site 1 Road (15th Street E). Concurrence with the berm location proposal from Air Force Plant 42 is expected to be obtained in the near term.

3. Need for Additional Simulations Pursuant to VIS-2(E)

The requirement to redo KOP simulations post construction was discussed at the February 11, 2010 workshop. During that workshop CEC Staff agreed that new simulations are only required to the extent that color and texture treatments differ from what was depicted in previous simulations. For purposes of the condition, it is assumed that Applicant's KOP-2 from the AFC will be renumbered as KOP-4. Therefore, the Applicant proposes revised language for VIS-2(E) as follows:

VIS-2 The project owner shall also color and finish the surfaces of all project structures and buildings visible to the public to ensure that they: (1) minimize visual intrusion and contrast by blending with the landscape; (2) minimize glare; and (3) comply with local design policies and ordinances including special design standards (i.e. height limits) for project development within a scenic highway viewshed pursuant to the city of Palmdale General Plan's Environmental Resources Policy. The transmission line conductors shall be non-specular and non-reflective, and the insulators shall be non-reflective and non-refractive.

The project owner shall submit a Surface Treatment Plan to the Compliance Project Manager (CPM) for review and approval. The treatment plan shall include:

A. A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes;

B. A list of each major project structure, building, tank, pipe, and wall; transmission line towers and/or poles; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and number; or according to a universal designation system;

C. One set of color brochures or color chips showing each proposed color and finish;

D. The construction of the transmission line and towers near Pearlblossom Highway shall implement special design standards (i.e. height limits) pursuant to the city of Palmdale General Plan's Environmental Resources;

E. In the event that color treatments or textures differ from what was proposed by the Applicant in the AFC or in subsequent submittals, the Applicant shall provide one set of 11" x 17" color photo simulations at life size scale of the revised treatment for project structures, including structures treated during manufacture, from Key Observation Point 4;

F. A specific schedule for completing the treatment; and

G. A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not request vendor treatment of any buildings or structures during their manufacture, or perform final field treatment on any buildings or structures, until the project owner has received Surface Treatment Plan approval by the CPM.

Verification: At least 90 days prior to specifying vendor color(s) and finish(es) for structures or buildings to be surface treated during manufacture, the project owner shall submit the proposed Surface Treatment Plan to the CPM for review and approval and simultaneously to the city of Palmdale Planning Department for review and comment. The project owner shall provide the CPM with the City's comments at least 30 days prior to the estimated date of providing paint specification to vendors.

If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the Surface Treatment Plan must be submitted to the CPM for review and approval.

Within ninety (90) days after the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and is ready for inspection; and shall submit one set of electronic color photographs from the Key Observation Points. The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify: a) the condition of the surfaces of all structures and buildings at the end of the reporting year; b) maintenance activities that occurred during the reporting year; and c) the schedule of maintenance activities for the next year.

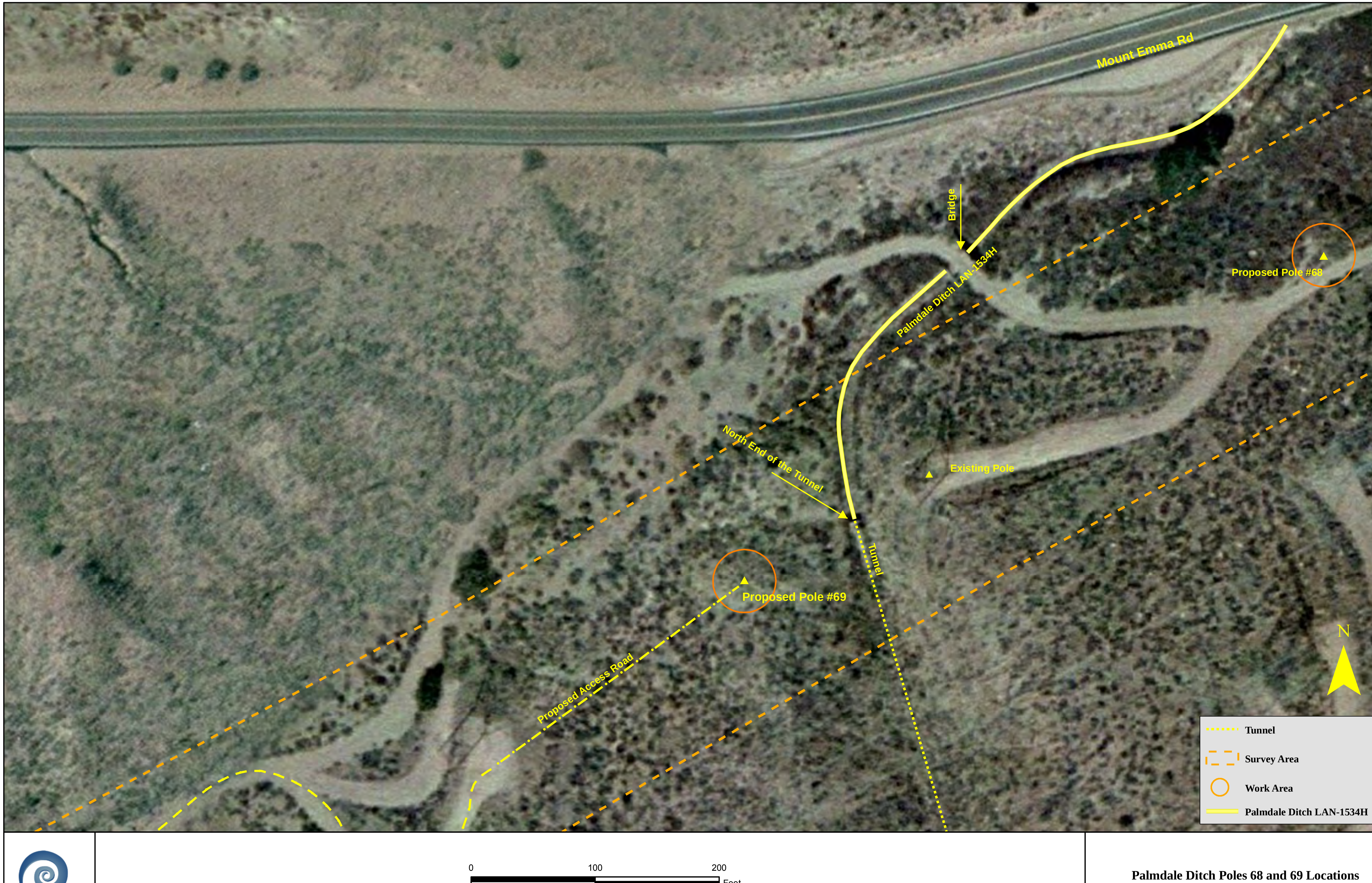
<u>CULTURAL RESOURCES</u>

Attachment CR-1

Palmdale Ditch Poles 68 and 69 Locations

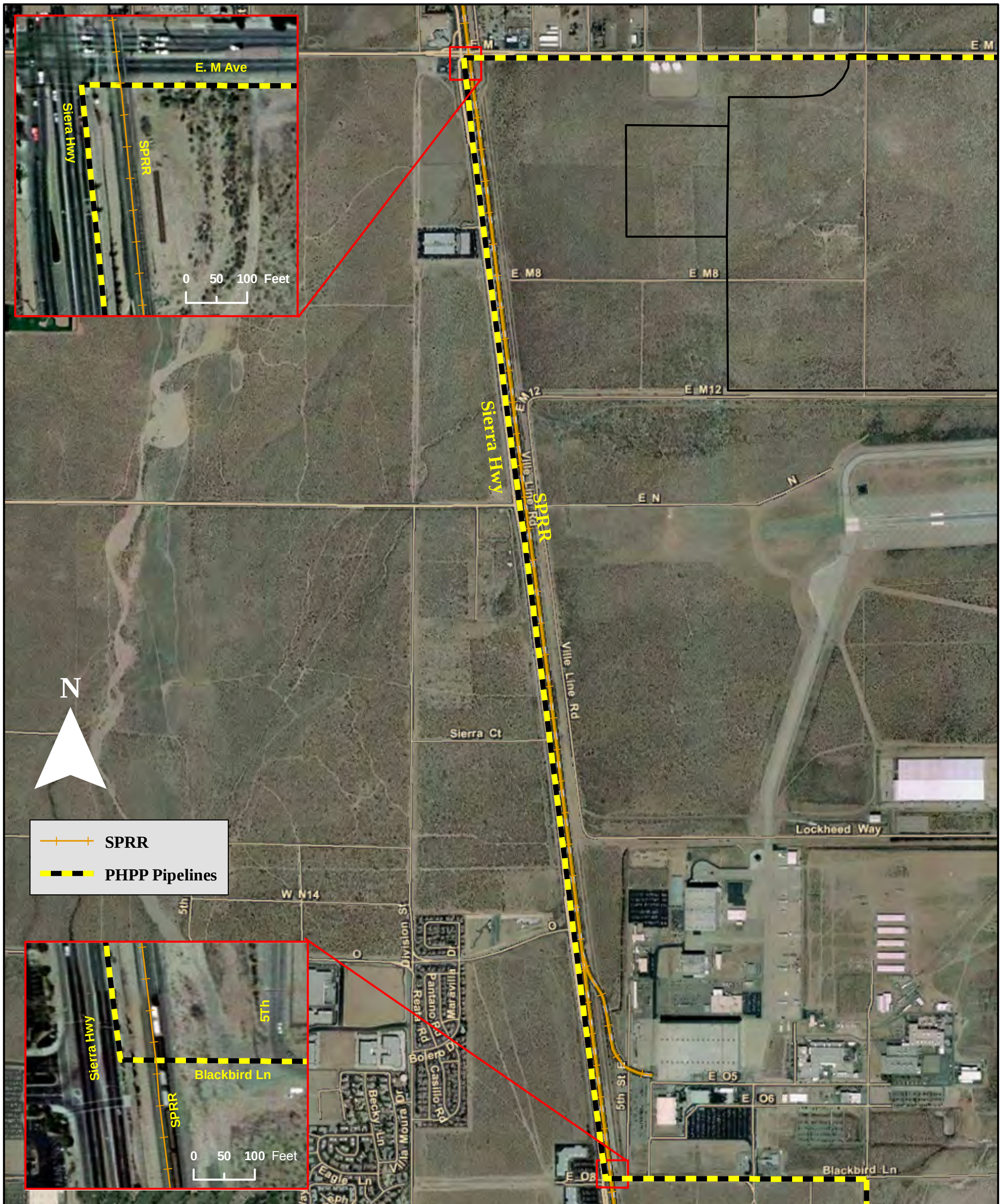
Locations of SPRR and PHPP Pipelines

SPRR Palmdale to Colton Spur PHPP Pole Locations



WSA

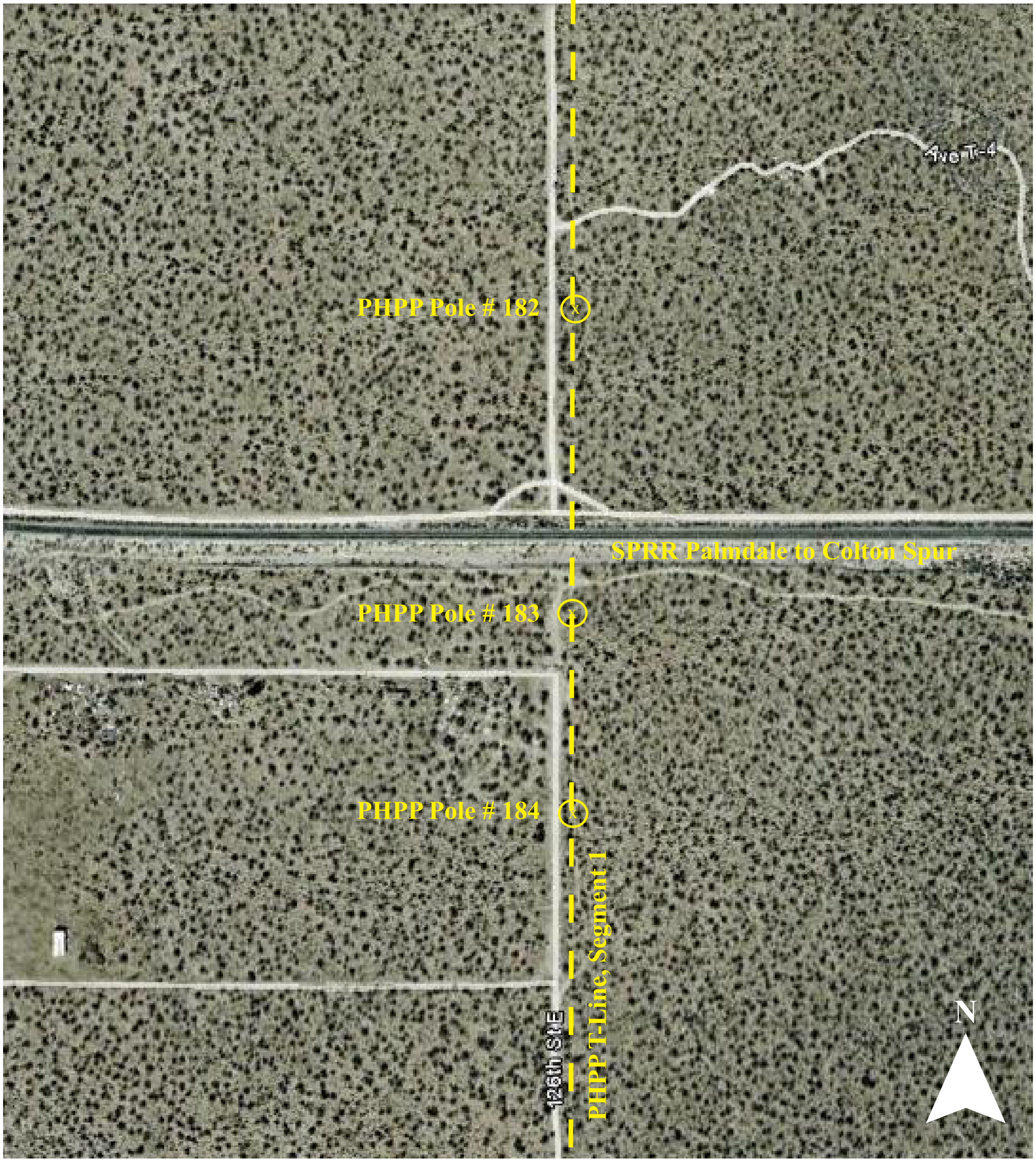
Palmdale Ditch Poles 68 and 69 Locations
Palmdale, California



WSA

0 750 1,500 3,000 Feet

Locations of SPRR and PHPP Pipelines
Palmdale, California



PHPP Pole Location
PHPP T-Line

WSA

0 300 ft

SPRR Palmdale to Colton Spur
PHPP Pole Locations
Palmdale, CA

LAND USE

Attachment LU-1

City of Palmdale Letter Regarding General Plan and Zoning Compliance for the PHPP Transmission Lines

PALMDALE

a place to call home

March 2, 2010

38300 Sierra Highway

Palmdale, CA 93550-4798

Tel: 661/267-5100

Fax: 661/267-5122

TDD: 661/267-5167

Ms. Felicia Miller
California Energy Commission
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

RE: General Plan and Zoning Compliance for the Palmdale Hybrid Power Plant and Transmission Lines

Dear Ms. Miller:

As requested by the California Energy Commission staff, we are providing the following information setting forth General Plan and Zoning Ordinance compliance for the Palmdale Hybrid Power Plant (PHPP) and related transmission lines. Information concerning the PHPP's conformance with the General Plan has been provided to your office previously. However, to reiterate, the General Plan for the City of Palmdale has been prepared pursuant to California Code Section 65300, which requires the city to adopt a comprehensive, long-term general plan for the physical development of the city and any land outside its boundaries which in the planning agency's sphere of influence and has a relation to its planning efforts.

The General Plan identifies the following Goals, Objectives and Policies related the PHPP and related transmission lines as follows:

GOAL L2: Adopt land use and development policies which encourage growth and diversification of the City's economic base.

Objective L2.1: Promote creation and retention of businesses within the City, to increase employment opportunities within the Antelope Valley.

Policy L2.1.7: Support new technologies which may result in increased business opportunities within the City.

Policy PS1.6.2: Coordinate installation of utility line placement with street construction where possible, to minimize cost.

Policy PS1.6.3: Through the development review process, protect existing utility easements and require dedication of additional easements where needed.

Objective CD 10.1: In reviewing site design of projects within industrially-designated areas, consideration should be given to the location and setting of the project with respect to site visibility, adjacent uses and designations, abutting roadways, and other similar factors, to ensure that development requirements are appropriate for the vicinity and the intended use.

GOAL CD 10: Facilitate creation and expansion of industrial uses within the City to accommodate manufacturing, distribution, and complementary office and support uses in order to expand the City's employment and economic base and improve the jobs/housing balance, while ensuring that such areas are compatible with adjacent uses and minimizing adverse impacts on more restrictive use districts.

The proposed PHPP and related transmission lines will promote creation of business in the City by increasing short-term construction employment opportunities and increased construction material demands. The project will also result in long-term employment opportunities for operations and maintenance functions. The project also incorporates new power generating technologies and a solar power generating component that will likely result in increased business opportunities within the City. The General Plan also promotes the use and development of renewable alternative energy such as the proposed solar power component of the use.

The facility site and transmission lines have been sited in locations that are compatible with the adjacent land uses and which haves minimal impact on the adjacent land use districts. The facilities, including transmission lines, are compatible in size and intensity with the aircraft manufacturing facilities located to the east of the site, the airport runways to the south and Union Pacific Railroad to the west, and vacant industrially designated sites in the easterly portions of the City.

The City of Palmdale Zoning Ordinance is used to implement the goals and objectives of the General Plan. The City Zoning Ordinance permits utility facilities in all zone districts within the City. These facilities, as defined in Chapter 1 of the Zoning Ordinance, include power transmission facilities and the related transmission lines for electrical power as set forth in the Zoning Ordinance. Therefore, the PHPP and related transmission lines as currently proposed are in compliance with each of the Palmdale Zone Districts through which they pass. **Based on this information, the City of Palmdale has determined that the plant and transmission lines are in conformance with the General Plan goals and the adopted regulatory standards set forth in the City's Zoning Ordinance.**

Please contact me at (661) 267-5300 should you have any further questions regarding this matter.

Sincerely,

Laurie Lile
Assistant City Manager

cc: Inland Energy

<u>SOIL AND WATER RESOURCES</u>

Attachment S&W-1

PHPP Draft Construction Storm Water Pollution Prevention Plan (SWPPP)

AECOM Environment

Prepared for:
City of Palmdale

Prepared by:
AECOM
Camarillo, CA
60138827-300
March 2010

Draft Storm Water Pollution Prevention Plan

Palmdale Hybrid Power Project

AECOM Environment

Prepared for:
City of Palmdale

Prepared by:
AECOM
Camarillo, CA
60138827-300
March 2010

Storm Water Pollution Prevention Plan

Palmdale Hybrid Power Project

Draft

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Prepared By Bryan Elder

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Reviewed By Roy Hauger, PE

Contents

List of Attachments

1.0 Title Page

SITE / PROJECT NAME:

Palmdale Hybrid Power Project

WASTE DISCHARGE ID NO.

To be determined once issued

LOCATION (Physical Address):

950 East Avenue M (Columbia Way)

Palmdale, California

PROPERTY OWNER:

City of Palmdale

38250 Sierra Highway
Palmdale, California, 93550

Contact and Title: To be determined

Phone: To be determined:

CONTRACTOR:

Company Name: To be determined

Address: To be determined

Contact and Title: To be determined

Phone: To be determined

EMERGENCY CONTACT:

Company Name: To be determined

Contact and Title: To be determined

Phone: To be determined

2.0 Certification

2.1 Initial SWPPP Certification

Project Name:	Palmdale Hybrid Power Project (PHPP)

To be completed by SWPPP Preparer

"I certify that this document and all attachments thereto were prepared under my direction or supervision. I further certify that the information contained herein is true and accurate to the best of my knowledge." I am a Qualified SWPPP Preparer (QSP) or will complete the required QSP training by June 30, 2012.

QSP's Signature	Date
Roy Hauger, P.E.	
QSP's Name and Title	Telephone Number

To be completed by Contractor

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Contractor's Signature	Date
Contractor's Name and Title	Telephone Number

2.2 SWPPP Approval

Project Name:	Palmdale Hybrid Power Project (PHPP)

For City of Palmdale Use Only

Certification of the Storm Water Pollution Prevention Plan (SWPPP)

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

City of Palmdale Signature	Date
City of Palmdale Name and Title	Telephone Number

3.0 Introduction

3.1 Introduction

This draft Storm Water Pollution Prevention Plan (SWPPP) is preliminary as it is prepared in advance of the final phase of construction planning and engineering design. This final phase is anticipated to include details regarding construction schedule and contractor selection as well as the final design. This draft SWPPP will be updated as required to incorporate the details of the final engineering design. This will take place no later than 60 days prior to initiation of construction activities.

The updated final SWPPP will be submitted as part of the Permit Registration Documents (PRD) package to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ, effective July 1, 2010. (SRWQCB, 2009) The PRD will include a Notice of Intent, updated Site map(s), the updated SWPPP that includes the Risk Assessment, Post-Construction Water Balance Calculation, and the appropriate fee. At this time, it is anticipated that the site development will not require an Active Treatment System for discharge of storm water.

3.2 Project Overview

The City of Palmdale proposes to locate a solar power plant in the City of Palmdale in Los Angeles County, California. The proposed Project consists of a hybrid of natural gas-fired combined-cycle generating equipment integrated with solar thermal generating equipment. The combined-cycle equipment will utilize two natural gas-fired combustion turbine generators, two heat recovery steam generators (HRSG) and one steam turbine generator (STG). The solar thermal equipment will utilize arrays of parabolic collectors to heat a working fluid. The hot working fluid will then be used to boil water to generate steam. The combined-cycle equipment is integrated thermally with the solar equipment at the HRSG and both utilize the single STG. The Project will have a nominal electrical output of 570 megawatts. The solar thermal input will provide approximately 10 percent of the peak power generated by the plant during the most energy demanding time of the day.

3.3 Project Setting

The project is located within the Antelope-Fremont Valley watershed. The site consists of approximately 650 undeveloped acres (herein referred to as the project area) west of Air Force Base Plant 42 bordering Sierra Highway on the west and Avenue M (Columbia Way) on the north. The solar collectors will occupy approximately 250 acres of land adjacent to the power block. The project site, including the solar field, will be located on the east half of the available land and in total will occupy approximately 330 acres.

The remaining land west of the proposed solar field will be used as a fill site for placement of excess cut material. This land may also be used as a lay down area, if required, during construction. The remaining land will be graded so that storm water drains to an infiltration pond that will be added to the west of the access road. The conceptual site layout and is found in **Attachment A**.

3.3.1 Description of Associated Transmission Lines

The PHPP project will include connecting the project to the natural gas, reclaimed water, potable water, and sanitary sewer utilities. The connections will require construction of pipelines. Each of these proposed pipelines and associated routes are described in more detail as follows:

Proposed 8.7-mile Natural Gas Pipeline: The proposed 8.7-mile natural gas pipeline alignment originates at a Southern California Gas facility on East Avenue S and terminates at the project site. It will be installed in existing street right of ways (ROWs) and is located mostly within developed areas.

Proposed 7.4-mile Reclaimed Water Pipeline: The proposed 7.4-mile reclaimed water pipeline alignment originates from the City of Palmdale Water Reclamation Plant to the PHPP plant site. It will be installed in existing city street ROWs and is located within developed areas.

Proposed 1.0-mile Potable Water Pipeline: Los Angeles County Waterworks District No. 40 has an existing potable water pipeline along East Avenue M that currently terminates a short distance west of the project site's northern border. The proposed 1.0-mile potable water pipeline alignment will run along East Avenue M and be constructed to connect the project to the existing pipeline.

Proposed 1.0-mile Sanitary Sewer Connection: The proposed 1.0-mile sewer connection alignment originates at the project site and will connect with an existing Los Angeles County Sanitation District sewer line. The connection point will be at the intersection of 15th Street East and East Avenue L.

Proposed 35.6-mile Electrical Transmission Line Connection: The project also proposes to construct an electrical transmission interconnection to the existing Southern California Edison Company's (SCE) Vincent Substation. The interconnection will require 35.6 miles of generation transmission lines (gen-tie) to connect the project to the Vincent Substation. The initial portion will be located along existing road ROWs. The last 11 miles of the gen-tie is proposed to be along the SCE's ROW between the Pearblossom Substation and Vincent Substation.

The transmission line routing layout is found in **Attachment A.**

3.4 Watershed and Receiving Water Assessment

The PHPP site and a majority of the transmission line project are located in the Amargosa-Anaverde, Pearland, Little Rock, and Big Rock Watersheds of the regional Antelope-Fremont Valley Watershed. This watershed is under the jurisdiction of the Lahontan Regional Water Quality Control Board. The southernmost segment of the transmission line is located in the upper portions Soledad Canyon Creek of the Santa Clara River Watershed. This watershed is under the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB)..

Surface waters in the Amargosa-Anaverde, Pearland, Little Rock, and Big Rock Watersheds flow north out of the San Gabriel Mountains into low lying, seasonally dry lakebeds in the Antelope Valley, including Rosamond Lake near Edwards Air Force Base. Rosamond Lake is a seasonally dry lake located approximately 11 miles north of the site.

Surface waters in the Soledad Canyon Creek Watershed flows west out of the San Gabriel Mountains into the Santa Clara River. The Santa Clara River ultimately discharges into the Pacific Ocean.

The California Aqueduct flows through the southern portion of the Project area bringing water from the San Joaquin–Sacramento River Delta to southern California. Additionally, the Palmdale Ditch is a constructed channel that connects Little Rock Reservoir to Lake Palmdale at the southern edge of the City of Palmdale. Little Rock Reservoir is located upstream of the project. However, storm water from the project area will not flow into the California Aqueduct or Lake Palmdale because these water bodies are protected by raised embankments.

3.5 Pre-Development Drainage

The area available for the proposed improvement is surrounded by East Avenue M on the north, Southern Pacific Railroad and Sierra Highway on the west, Avenue M-12 on the south and the Air Force Base on east. All these boundary elements work as drainage barrier for the project area and separate it from the surrounding drainage basins. Therefore, no runoff from the surrounding area enters the project area. However, a concrete channel, running between Sierra Highway and Southern Pacific Railroad crosses the project area at the northwest corner and continues towards north crossing East Avenue M. Based on inspection by KPE, it appears that no water from the site enters the channel. (DESCP, KPE 2008).

The existing topographic conditions of the Palmdale Project Area depict an average slope of one percent (-1%) towards north and northeast. Near the center of the site, there are multiple low spots where ponding occurs. The remaining water flows toward north and northeast. There is a shallow concrete box culvert, located west of the intersection of East Avenue M and Site 1 Road (entrance road for Air Force Base), crossing Avenue M at a skew angle. This culvert connects to a double grate inlet structure on the upstream side, located on the south edge of Avenue M, and discharges north of East Avenue M. However, silt accumulation has almost filled this inlet and the box, and it appears that the culvert is nonfunctional. Considering the topography of the existing site and the condition of the existing culvert at the northeast corner, it appears that the project area allows ponding at low spots within its boundary and does not discharge storm water except for major storm events. Preliminary drainage calculations confirm that a few low spots on Avenue M close to the northeast corner of the project site are subject to flooding during the 25-year storm event and greater. Natural swales and naturally low-ponding areas exist on site and there are no drainage ditches or storm drains on the existing project site. However there is an irrigation channel along the southern Pacific Railroad, but no water from the site enters the channel (DESCP, KPE 2008).

3.6 Post-Development Drainage

The document TC-11 of the California Storm water best management practices (BMP) Handbook – New Development and Redevelopment (California Storm Water BMP 2003) serves the basis for the drainage design concept. The design intent of the proposed drainage is that the post-development discharge from the Project Area shall not exceed the pre-development discharge for the 100-year storm event. The infiltration basins are designed to contain the differential run-on between the pre-development and post-development conditions for the 100-year storm event. Infiltration basins are shallow, natural filters for removing pollutants in storm water run-on and runoff. Water collected in the basins infiltrates through the soil to the subsurface. In this case, as there is no discharge from the project area for the existing condition, no discharge will leave the project area after the proposed improvement for the 100-year storm event. The proposed infiltration basins are designed to retain the run on from the entire project area for the 100-year storm event. This will also help to capture any sediment flowing along with storm run on during construction. The infiltration basins shall be protected from erosion by stabilizing the side slopes using Soil Sement or similar product (DESCP, KPE 2008).

It should be noted that the current design approach is based on preliminary assumptions and findings, and may require modifications during final design. However, the design concept will remain essentially the same.

Based on conceptual layout of the proposed development, the project site has been divided into two main watersheds, the North Watershed and the South Watershed. The undeveloped part of the project area (roughly 280 acres) is considered as a separate watershed. The proposed development does not allow storm water flow from this undeveloped part of the land through the solar field. The run on from this watershed flows north along the west side of the proposed access road and is collected and retained in northwest infiltration basin near Avenue M (Columbia Way) and 10th Street East (Challenger Way). The northwest infiltration basin is designed to contain the 100-year storm event.

North Watershed: The North Watershed includes roughly 127-acre of the solar field north of the access road and roughly the northern half of the power block 13 acres) and drains to the north into north infiltration basin. The proposed grading for the post development condition directs flow towards the north and the run on is contained in the proposed north infiltration basin.

South Watershed: The South Watershed includes roughly 175 acres of the solar field south of the access road and the southern half of the power block area (roughly 12 acres) and drains to infiltration basins located on the south side of the access road and the south side of the power block area. The solar field of South Watershed is again divided into two major areas; the eastern part drains to southeast infiltration basin and the western part drains to southwest infiltration basin.

Power Block: The power block area is located midway along the eastern edge of the project site. The power block area drains toward north and south by means of sheet flow, swales, inlets, and/or storm sewers. The northern half of the power block drains towards the northeast corner of the power block area where the runoff enters a swale that flows to the north infiltration basin. The southern half of the power block drains into the southeast infiltration basin on the southern edge of the Power Block.

Solar Field: The Solar Field is graded at a -0.6 percent slope towards northeast resulting in -0.2 percent slope from west to east. The gentle slope keeps storm water flow velocity low, thus minimizing the amount of sediments picked up by the runoff. In addition, dust palliative product, such as Soil-Sement, shall be applied to stabilize the bare ground on the solar field and to minimize the potential surface erosion.

The north infiltration basin, southeast infiltration basin and southwest infiltration basin are designed to contain the run-on for at least the 25-year storm event with the 100-year storm event backing up into the solar field to a depth no greater than 2 feet (DESCP, KPE 2008).

Infiltration Basins: The PHPP facility has been designed to provide storm water management via four infiltration basins ranging in size from 0.87 to 5.38 acres of storm water infiltration area. The PHPP Conceptual Layout provides the proposed locations of the four PHPP infiltration basins. The two primary infiltration basins are located along the northern perimeter of the site, between the site screening berm and the North Solar Field, while the two smaller, secondary basins are located along the northern end of the South Solar Field. The storm water infiltration basins are designed and engineered, and will be constructed and maintained, to ensure a maximum of a 48-hour detention period after the design storms, and are designed to remain dry in between storm events.

The Project Applicant has performed detailed infiltration calculations and run various design models employing Darcy's Law, the Kozeny-Carman model, and Natural Resources Conservation Service published data, in order to confirm that site soils are capable of draining completely within the required maximum (i.e., 48-hour) detention time for both the 10-year and 100-year design storms. In addition, during the pre-construction phase, the Applicant plans to perform field percolation tests to confirm the design assumptions used in the calculations. In order to emphasize the conservative design of the PHPP infiltration basins, it should be noted that the 10-year (2.34 inches) and 100-year (2.75 inches) storm design basis values of the infiltration basins represent a major fraction of the total annual mean rainfall in Palmdale of 7.36 inches per year, based on the National Oceanic & Atmospheric Administration Climatological data. In other words, one would need to go back more than 60 years to find dates where rainfall events exceeded the 10-year and 100-year storm events.

It should also be noted that the area surrounding the PHPP site has historically experienced problems with periodic flooding after major rainfall events, particularly along Sierra Highway and East Avenue M, and because the PHPP infiltration basin design will maximize storm water infiltration, which reduces the potential for area flooding and storm flows to the existing drainage areas this, in turn, will reduce the amount of standing water after major rainfall events throughout the vicinity of the PHPP. The project site will retain storm water on site during construction and during operation; therefore the disturbed areas will not discharge water either directly or indirectly to a 303(d)-listed water body impaired by sediment.

Proposed Visual Berm: A 10-foot wide, 8-foot tall, 3,050-foot long earthen berm has been proposed to mitigate the visual impacts of the PHPP. This earthen berm would need armoring or other means of protecting the berm soil from wind and storm water erosion. Erosion of this berm from water would degrade its purpose as a visual screen and increase sediment loading down slope of the berm to the PHPP‟s detention basins on one side and a drainage culvert along Avenue M on the other side.

3.7 Risk Assessment

3.7.1 PHPP Site Type Determination

The project type for the PHPP is determined by assessing the sediment risk and combining it with the Receiving Water risk. The sediment risk assessment for the PHPP project was determined using a Site Specific Risk Assessment. The sediment risk calculation used the following inputs

1. Erosivity Index – Factor of 36.02 based on the project location and derived from the National Pollutant Discharge Elimination System (NPDES) calculator provided in the Appendix 1 of the 2009 General Permit

2. Soil Erodibility (K) Factor of 0.24 based on average site soil gradation analysis using the nomograph in the Appendix 1 of the 2009 General Permit

3. Length- Slope (LS) Factor of 0.395 based on interpolation of the actual site conditions in the LS table in the Appendix 1 of the 2009 General Permit

4. Cover (C) Factor of 1.0 and Management Operations and Support Practices (P) Factor of 1.0 based on bare ground conditions

Based on these inputs, the sediment risk assessment calculation determined that the site sediment risk factor for the project is 3.4 tons per acre. Therefore, this risk factor meets the criteria of Low Sediment Risk (that is less than 15 tons per acre) for the project. Please see the detailed computation sheet in **Attachment D**.

The Receiving Water (RW) Risk Factor was determined using the RW Risk Factor Worksheet in Appendix 1 of the General Permit. The project will retain storm water on site during construction and during operation; therefore the disturbed areas will not discharge water. In addition the PHPP is located within the Antelope-Fremont Valley Watershed. According to the Lahontan Regional Water Quality Control Board Basin Plan, the Amargosa□Anaverde, Pearland, Little Rock, and Big Rock Washes and Rosamond Lake are not listed on the Clean Water Act Section 303(d) list of impaired water bodies. . Therefore, the receiving water risk factor is Low.

Combining the Sediment Risk factor (Low) and the Receiving Water Risk factor (Low) indicate that the project has a Combined Risk Level of a Type 1 project.

3.7.2 Transmission Lines Type Determination

The LUP type is determined by evaluating the answers to a series of questions found on a flow chart in Attachment A.1 of the 2009 General Permit and then if necessary, determining the sediment risk. Since this SWPPP is preliminary and project details have not all been completed, this evaluation has assumed that the answers to the restoration questions will be □no. Although the final project implementation procedures may more accurately answer these questions with a □yes□, this evaluation has adopted a conservative approach to the determination of the LUP project type by adopting □no□answers. The Final SWPPP may or may not revise this approach and the resulting LUP type.

The transmission line segment linear utility project (LUP) is located within both the Lahontan and the Los Angeles Regional Water Quality Control Board (LARWQCB) jurisdictions. Although a majority of the transmission line work lies within the Lahontan RWQCB jurisdiction of the Antelope-Fremont Valley Watershed, the southern-most two miles of the transmission line segment is located in the Soledad Canyon Creek (sub)watershed of the Santa Clara River watershed.

As outlined on the Flow Chart in Attachment A.1 of the 2009 General Permit, the determination of a LUP project or project section area type begins by answering the series of questions found in Appendix A.1 flow diagram. The series of questions and responses are as follows:

1. *Will ≥ 70□ of the construction activity occur on paved surfaces□□?*
   No, the segment of the transmission replacement line from Pearblossom to Vincent Substation (11.9 miles of the 35.6 miles total) will not occur on paved surfaces.

2. *Will the construction activity occur on unpaved improved roads, including their shoulders or land immediately adjacent to them?*
   Yes, the new line from the power plant site to the Pearblossom pumping station will occur in areas adjacent to existing paved□unpaved roads and replacement line from Pearblossom to Vincent Substation will occur on unpaved improved roads in the existing SCE right of way

3. *Will areas disturbed be returned to preconstruction conditions or equivalent condition□at the end of the day?*
   This construction procedure has not yet been established but will be established in the final design. Therefore a conservative default response of "no" has been adopted.

4. *Will areas of established vegetation disturbed by the construction be stabilized and revegetated by the end of the project?*
   This construction procedure has not yet been established but will be established in the final design. Therefore a conservative default response of "no" has been adopted.

5. *When required, will adequate temporary stabilization BMPs be installed and maintained until vegetation is established to meet the Permit's minimum cover requirements for final stabilization?*
   This construction procedure and post-construction measure has not yet been established but will be established in the final design. Therefore a conservative default response of "no" has been adopted.

If questions □2 to □5 above are reviewed in the final SWPPP and the answers are changed to "yes" then the LUP would be a Type 1. Since the conservative approach has answered the questions with "no" the determination of the LUP type continues through (box "E") to the next page of the LUP Type determination flow chart with the following question.

6. *"Is the project area or project section area located within a Sediment Sensitive Watershed?"*
   As discussed below the transmission line project is not located within a Sediment Sensitive Watershed.

The definition of a sediment sensitive watershed is a watershed draining into a receiving water body listed on EPA's approved 303(d) list for sedimentation/siltation, turbidity or a water body designated with beneficial uses of Spawning, Reproduction, and/or Early Development (SPWN), Migration of Aquatic Organisms (MIGR) and Cold Freshwater Habitat (COLD),.

As discussed above, the majority of the transmission line segment linear utility project is located within the Antelope-Fremont Valley Watershed. According to the Lahontan Regional Water Quality Control Board Basin Plan, the Amargosa/Anaverde, Pearland, Little Rock, and Big Rock Washes and Rosamond Lake are not listed on the Clean Water Act Section 303(d) list of impaired water bodies. . Therefore, the receiving water risk factor is Low for the segment of the transmission lines within the Antelope-Fremont Valley Watershed.

According to the LARWQCB Basin Plan (LARWQCB, Soledad Canyon is defined as Reach □8 of the Santa Clara River. The beneficial uses of Soledad Canyon Creek include municipal, industrial, agriculture, groundwater recreation and Warm Freshwater Habitat (WARM) but do not include SPWM, MIGR or COLD . Review of the 2008 CWA Section 303(d) list of water quality limited sections, finds that Reach □8 of the Santa Clara River (Soledad Canyon Creek) is not included on the list of impaired water bodies. The next downstream reach of the Santa Clara River , Reach □7, is on the 303 (d) list for coliform bacteria. Therefore, the receiving water risk factor is Low for the segment of the transmission line located in the Soledad Canyon Creek Watershed.

The sediment risk assessment for the transmission lines was determined using the Risk Determination Worksheet (2009 permit). The sediment risk was determined for a typical segment in the San Gabriel Mountains to be conservative although sections of the transmission lines that are not in the mountains could result in a lower sediment risk. The sediment risk calculation used the following inputs

1. R Factor of 51.02 based on the project location and derived from the National Pollutant Discharge Elimination System (NPDES) calculator provided in the Appendix 1 of the 2009 General Permit and using a 3 year disturbance to stabilization period

2. K times LS Factor of 0.8 based on USEPA EMAP Risk Figure (Figure 1 of NPDES Fact Sheet

3. C Factor of 1.0 and P Factor of 1.0 based on bare ground conditions

Based on these inputs, the sediment risk assessment calculation determined that the site sediment risk factor for the project is 40.8 tons per acre. Therefore, this risk factor meets the criteria of Medium Sediment Risk (that is less than 75 tons per acre) for the project. Please see the detailed computation sheet in **Attachment D**.

Combining the responses to the Appendix A.1 questions, the Receiving Water Risk (Low) and the Sediment Risk factor (Medium) indicate that all segments of the transmission project will conservatively have a Combined Risk Level for a Type 1 LUP.

3.8 Water Balance Calculation

The water balance calculation will be completed once the final design has been completed. The completed calculation will be placed in **Attachment E**.

4.0 SWPPP Implementation

4.1 Objectives

This SWPPP has the following main objectives:

- Identify all pollutant sources, including sources of sediment that may affect the quality of storm water discharges associated with the construction activity (storm water discharges) from the construction site;
- Identify non-storm water discharges;
- Identify, construct, implement in accordance with a time schedule, and maintain BMPs to reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from the construction site during construction;
- Develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs);
- Identify a sampling and analysis strategy and sampling schedule for discharges from construction activity that discharge directly into water bodies listed on Attachment 3 of the Permit (Clean Water Act Section 303(d) Water bodies listed for Sedimentation); and
- For all construction activity, identifying a sampling and analysis strategy and sampling schedule for discharges that have been discovered through visual monitoring to be potentially contaminated by pollutants not visually detectable in runoff.

Once a final design has been established, the site maps showing the construction project in detail will be prepared. Site conditions, including paved areas, buildings, lots and roadways, general topography and drainage patterns for storm water collection will be shown for the following phases of construction.

This SWPPP will be modified and amended to reflect any amendments to the Permit or any changes in construction or operations that may affect the discharge of pollutants from the construction site to surface waters, groundwater, or the municipal separate storm sewer system (MS4). The SWPPP will also be amended if it is in violation of any condition of the Permit or has not achieved the general objective of reducing pollutants in storm water discharges. The SWPPP shall be readily available on-site for the duration of the project.

The construction activity will not discharge directly to a water body listed as impaired for sedimentation□siltation or turbidity under the Clean Water Act Section 303(d); therefore, a sampling and analysis strategy for turbidity or settleable solids will not be established. **Section 5** provides a sampling strategy for non-visible pollutants for background only, or as it becomes necessary.

4.2 Implementation Schedule

The construction schedule has not been finalized. Once it is finalized, the major milestone information will be completed. At least 60 days prior to construction, the PRD package will be submitted to obtain coverage under the General Permit. The PRD will include an completed Notice of Intent, a sample copy is provided in **Attachment F**.

Table 4.2-1: Project Schedule – Major Milestones

Activity	Date
Project Mobilization	To be Determined
PHPP Construction	To be Determined
Transmission Line Construction	To be Determined

Construction will generally be scheduled to occur between 5:00 A.M. and 7:00 P.M. on weekdays and Saturdays. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g. pouring concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities may continue 24 hours per day, 7 days per week.

4.3 Project Activities

The construction phases of the project as they pertain to storm water management are expected to be as follows:

- **Project Mobilization** □Temporary construction facilities and lay down areas adjacent to the power block will be established. Temporary facilities will include trailer offices or equivalent, chemical toilets, temporary parking, tool sheds□containers, and initial construction equipment parking.
- **Site Disturbances** □Within the power equipment areas, clearing and grubbing will be performed over the entire area. As much as possible, stripped topsoil will be collected and will remain on site and utilized as necessary in site-designated□specific areas. Native vegetation will be harvested for reuse to obtain long-term soil stabilization.
- **Preparation** □Parking areas for construction workers and lay down areas for construction materials will be prepared per appropriate drawings. Detailed information regarding the location within the site of the lay down and parking areas will be developed after a Contractor is hired, and incorporated into the SWPPP as appropriate and□or by amendment.
- **Access Road** □Primary access to the site will be via a new paved entrance from adjacent Avenue M. A stabilized entrance□exit will be provided to clean vehicle wheels prior to exiting the construction area.
- **Site Grading** □The existing site has about a 0.6 percent natural slope from south to north. Disturbance activities will include clearing and grubbing, topsoil stripping, and excavation of the infiltration basins. Extensive grading will be applied to the whole site including the power block areas, construction lay down areas, and the major access roads. Heavy equipment will be stored in designated areas to isolate□contain oil drips and for ease of clean up of unwanted lubricating liquids.
- **Foundation** □All underground piping, conduits, and wiring will be installed, followed by installation of the foundations for the new power equipment, transmission pull offs and tower to support, as necessary, overhead ground wire towers, and miscellaneous structures.

- **Power Block Construction** — Concrete, mechanical, and electrical work will be performed for the Power Block, with the aid of graders, rollers, front loaders, dump trucks, trenching machines, concrete mixer and pump trucks, cranes and pick-up trucks. Some of the above areas may impinge on areas intended for the later stages of site erection. As site erection nears completion in the block area, temporary construction mobilization areas will be reduced as required. The primary site equipment and materials lay down area will be maintained in one location, but there will also be smaller localized areas within the power blocks that may be relocated from time to time. Miscellaneous non-vehicle motorized equipment will also be used over the length of the job, such as vibrators, welding machines, etc.
- **Site Stabilization** — Finished sub-grade areas in the power block areas will have erosion protection in the form of well-graded crushed stone spread in disturbed areas.
- **Demobilization** — All temporary construction facilities will be removed.

Surface water impacts, if any, are anticipated to be a byproduct of short-term construction activity and consist of increased turbidity due to erosion of newly excavated or placed soils. Activities such as grading can potentially increase rates of erosion during construction. In addition, construction materials could contaminate runoff or groundwater if not properly stored and used. Compliance with engineering and construction specifications, following approved grading and drainage plans, and adhering to proper material handling procedures will ensure effective mitigation of these short-term impacts.

Erosion and sediment control BMPs, surface water pollution prevention measures, and other BMPs will be developed and implemented for both the construction and operational phases. These plans will be prepared in accordance with the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit) and local agency requirements.

4.3.1 Pipeline Construction

The construction of the gas and/or water pipeline will consist of the following:

- **Trenching** width depends on the type of soils encountered and requirements of the governing agencies. The optimal trench will be approximately 36 inches wide and five to ten feet deep. With loose soil, a trench up to eight feet wide at the top and three feet wide at the bottom may be required. The pipeline will be buried to provide a minimum cover of 36 inches. The excavated soil(s) will be stockpiled along one side of the trench and used for backfilling after the pipe is installed.
- **Stringing** consists of trucking lengths of pipe and laying them on wooden skids beside the open trench.
- **Installation** for gas piping consists of bending, welding, and coating the weld-joint areas of the pipe after it has been strung, padding the ditch with sand or fine spoil, and lowering the pipe string into the trench. Installation for PVC water piping shall consist of cleaning of the bell and spigot ends of each section of pipe prior to lowering it into the trench and then firmly pushing the pipe sections together to achieve the required seal. Installation methods will vary and contractors are urged to use their acceptable method in combination with BMPs to accomplish installation.

- **Backfilling** consists of returning spoil back into the trench around and on top of the pipe, ensuring that the surface is returned to its original grade or level. The backfill will be compacted to protect the stability of the pipe and to minimize subsequent subsidence.
- **Plating** consists of covering any open trench in areas of foot or vehicle traffic at the end of a workday. Plywood plates will be used in areas of foot traffic and steel plates will be used in areas of vehicle traffic to ensure public safety. Plates will be removed at the start of each workday. Efforts will be made to minimize the length of trench open at any given time.
- **Hydrostatic testing** (if required) consists of filling the pipeline with reclaimed water from the Los Angeles County Waterworks regional supply pipeline water, venting all air, increasing the pressure to the specified code requirements, and holding pressure for a period of time. . After hydrostatic testing, the test water will be analyzed for heavy metals and discharged to the City of Palmdale Publicly Owned Treatment Works (POTW) via the sewer, unless the analysis shows that the water is contaminated. In the case of contamination, the water would be transported to a permitted landfill or treatment facility. Temporary approvals for test water use and permits for discharge will be obtained by the construction Contractor, as required.
- **Cleanup** consists of restoring the surface of the roadway by removing any construction debris, grading to the original grade and contour, and repairing where required.
- **Commissioning** consists of cleaning and drying the inside of the pipeline, purging air from the pipeline, and filling the pipeline with natural gas or water as appropriate.

4.3.2 Transmission Line Construction

The construction of the transmission line will consist of the following:

- **Drilling** to install transmission towers. The excavated soil(s) will be stockpiled along one side of the boring,
- **Foundation** consists of installation of the concrete foundations for the new transmission towers to support overhead wires
- **Stringing** consists of laying out the wires and installing in the towers.
- **Cleanup** consists of restoring the surface of the access area by removing any construction debris, grading to the original grade and contour, and repairing where required.

4.4 Vicinity Map

The construction project vicinity map showing the project location, surface water boundaries, geographic features, construction site perimeter, and general topography, is located in **Attachment A**. The project's Title Sheet provides more detail regarding the project location and is also included in **Attachment A**.

4.5 Pollutant Source Identification

The potential sources that could add significant quantities of pollutants to storm water discharges at this project site are:

- Temporary equipment staging areas,
- Temporary stockpile areas, and

- Exposed excavations.

4.6 Topographical Map

A topographical map extending beyond the property boundaries of the project that shows the transmission line route and the general topography is included as **Attachment A** to this SWPPP.

4.7 Erosion Control Drawings

Detailed maps showing the following items will be developed once the design has been finalized and will include:

- Conceptual Rough Grading A plan with figures for interim grading and erosion control will be prepared. It will show the temporary on-site drainage patterns to be established by the grading of the project site, as well as any necessary erosion control features;
- Finished Project A drainage plan of the completed project;
- Areas of soil disturbance (e.g., soil removal or augmentation, such as excavations, trenches, berms, slopes, and fill);
- Areas of existing vegetation;
- Location of control measures;
- Drainage patterns and slopes adjacent to work areas;
- Temporary storage areas for soil import or export;
- Vehicle and equipment storage and service areas; and
- Existing and planned storage and service areas.

These maps will be maintained in the SWPPP file at the construction office.

4.8 BMP Selection

4.8.1 Related Construction Disturbance

The construction and operation of the project will not adversely affect the surrounding parcels. BMPs will protect surrounding area from flooding, erosion, sloughing, and sedimentation during both construction and operation.

4.8.1.1 Temporary Erosion Control Measures

Temporary erosion control measures will be required during the construction period to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation. These measures will be installed before construction begins and will be removed after completion.

Typically, temporary erosion control measures include re-vegetation, slope stabilizers, dust suppression, construction of beams and ditches, and sediment barriers. Vegetation is the most efficient form of erosion control, because it stabilizes the soil and maintains the landscape.

Vegetation reduces erosion by absorbing raindrop impact energy and holding soil in place with fibrous roots; it reduces runoff volume by increasing infiltration into the soil. Disturbed areas will be re-vegetated with rapidly growing groundcover as soon as possible after construction, and vehicle traffic will be restricted from re-vegetated areas.

During the construction of the proposed project, dust erosion control measures will be employed to minimize the wind-blown erosion of soil from the site. Reclaimed water or soil weighting or binding agents will be sprayed on the soil in construction areas to suppress dust and/or re-vegetation.

Sediment barriers, such as straw bales or silt fences, slow runoff and trap sediment. They are generally placed below disturbed areas, at the base of exposed slopes. Barriers will be placed around the proposed project and the active construction area of the Project to prevent sediment from leaving the site. Because the project site is relatively level to gently sloping, standard surface erosion control techniques are expected to be effective. Soil stockpiles generated during construction will be covered and protected from rainfall if left on site for long periods of time.

4.8.1.2 Permanent Erosion Control Measures

During operation of the proposed project, the applicant has proposed permanent erosion control measures to prevent potential soil related impacts. The PHPP power block would be covered predominantly with gravel and landscaping, which would serve to prevent wind and water erosion and maintain a high degree of the pre-PHPP water infiltration capacity of the soil. The balance of the PHPP power block would be covered by foundations and paving. The mirror fields would be graded, de-vegetated, and maintained by the use of soil weighting or binding agents. Adding impervious areas, removing vegetation, and using soil weighting or bonding agents would decrease storm water infiltration and increase its runoff velocity. However, the PHPP has been designed to retain all storm water from up to a 100-year storm event that would run on to the project and manage this storm water onsite through the use of infiltration basins.

Once the permanent erosion control measures are in place and construction activities are completed, the General Permit will need to be terminated using a Notice of Termination (NOT). The completed form will be filed in **Attachment P**. Please note that the SWPPP permit is not suspended until the RWQCB approves the NOT.

4.8.1.3 Measures to Prevent Flooding of Surrounding Areas

Unlined storm water retention and infiltration basins would be constructed at the PHPP site to retain storm water onsite from a 100-year, 24-hour storm event and allow it to infiltrate into the subsurface. The basins would cover approximately 10.51 acres. The storm water basins are designed to retain and infiltrate storm water for up to 48-hours or less after a storm event. No storm water from storm events up to 100-year storm events would leave the PHPP site. The construction and use of these storm water basins would reduce potential impacts from storm water related flooding to a level that is less than significant.

4.8.2 Inventory of Materials and Activities that May Pollute Storm Water

Construction materials and activities that have the potential to contribute pollutants, other than sediment, to storm water runoff are listed below. Control practices for each activity are identified in the Erosion Control Drawings (**Attachment B** - to be provided) and **Section 4.8.3** through **Section 4.8.11**. Construction materials and activities include:

- Vehicle fluids, including oil, grease, petroleum, and coolants;
- Asphaltic emulsions associated with asphalt-concrete paving operations;
- Cement materials associated with Portland cement concrete (PCC);
- Base and sub-base material;
- Joint and curing compounds;
- Concrete curing compounds;
- Paints;
- Solvents, thinners, acids;
- BMP materials;
- Treated lumber (materials and waste);
- PCC rubble; and
- General litter.

Construction activities that have the potential to contribute sediment to storm water discharges include:

- Clear and grub operations;
- Grading operations;
- Paving operations;
- Boring operations;
- Delivery/transportation operations;
- Utility excavation operations;
- Foundation/structure construction operations;
- Vehicle and equipment cleaning, fueling, and maintenance; and
- Painting.

4.8.2.1 Site Earthwork

Earthwork activities with heavy equipment will be required to grade a level area, cut new channels and to manage the soils for the power generation facility and switchyard. The volume of cut and fill is estimated to be approximately 900,000 cubic yards.

Earthwork on the power plant site will consist of removal of poor soils, topsoil, vegetation, and debris; excavation and compaction of earth to create the plant grade; and excavation for foundations and underground systems. Materials suitable for compaction will be stored in stockpiles within designated locations on the site using proper erosion prevention methods and then either reused on site (e.g., plant power block) or moved to the adjacent portion of the project site. Materials unsuitable for compacted fills will be stored in separate stockpiles and reused on the site, where appropriate.

Any contaminated materials encountered during excavation will be disposed in accordance with applicable laws, ordinances, regulations, and standards.

Maximum soil densities will be achieved by rolling or roller vibrating so that soils have the optimum conditions and uniform layers of specified thickness. Materials in each layer will be properly moistened to facilitate compaction to the specified density. To verify compaction, representative density and moisture content tests will be performed in the field during compaction. Structural fill material supporting foundations, roads, parking areas, etc., will be compacted. Prior to placing fill materials, sub grades will be examined for loose or soft areas and further excavated as necessary.

In an attempt to reduce erosion of alluvial soils, project construction will minimize land disturbance by limiting construction activities only to areas that are designated as being essential to the installation and operation of the project. In addition, disturbed soils will be compacted to reduce the rainfall absorptive capacity and vegetative productivity of the soils that are permanently covered by project facilities.

It will be necessary to segregate the stockpile surface soils and organic matter during construction and excavation. In areas of substantial grading, native vegetation will be harvested for reuse to obtain long-term soil stabilization and preserve native species such as Joshua trees. All excavated soils are to be reused during construction at the site to prevent subsequent erosion and sedimentation issues. Materials suitable for backfill will be stored in stockpiles at designated locations using proper erosion and sediment control methods.

Utility lines (water, electric, gas and communication) will be placed underground by means of open cut trenches.

4.8.2.2 Linear Construction

Construction of the utility lines will be by open trench. Trench excavation will consist of making sub-grade to the depth, width, and grade necessary for construction of the utilities. Excavated topsoil will be stockpiled separately from the underlying excavated soils using proper erosion and sediment control methods. The stockpiled topsoil would then be placed and compacted over the backfilled trench. Excess materials (i.e., sand, gravel, loose rock) will be incorporated into the unused portion of the site.

4.8.3 Existing (Pre-Construction) Control Measures

Initial BMPs possibly could include silt fence and/or sediment basin (SE-1, SE-2).

In areas that have initial construction erosional action potential, a row of silt fence (SE-1) and rip rap check dams (SE-4) will be installed per BMP fact sheets (**Attachment Q)**.

4.8.4 Nature of Fill Material and Existing Data Describing Soil

4.8.4.1 Soil Types

Soil types in the vicinity of the proposed PHPP site are noted in the Geotechnical Report. Soils are described and mapped at the level of “mapping unit”, which are defined to the approximate level of detail appropriate for making decisions about soil management. The location and properties of the soil mapping units were identified from draft maps of the area using an aerial photograph base and from preliminary drafts of soil property descriptions, both prepared by the Natural Resources

Conservation Service. The following paragraphs provide a brief description of the soil control measures to be utilized by the project.

4.8.5 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering or binding soil particles. The project will incorporate erosion control measures required by regulatory agency permits, contract documents, and other measures selected by the Contractor. Site-specific BMPs that will be implemented by the construction contractor and associated figures are to be included in **Attachment C**. **Attachment C** is to be revised and will list the final BMPs selected for this project. Guidance for maintaining and repairing BMPs is found in **Attachment G**.

Attachment Q contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for temporary and final erosion control based on BMPs from **Attachment C**.

The erosion control measures are as follows:

Year round:

- Qualified SWPPP Preparer (QSP) to monitor the weather using National Weather Service reports to track conditions and alert crews to the onset of rainfall events.
- Preserve existing vegetation where required and when feasible. Conduct clearing and grading only in areas necessary for project activities and equipment traffic. Install temporary fencing prior to construction along the boundaries of the construction zone to clearly mark this zone, preventing vehicles or personnel from straying onto adjacent off-site habitat.
- Within designated site development areas, all vegetation will be removed. Areas to remain undisturbed shall be clearly marked and existing foliage will remain in place to anchor the soil reducing the potential for erosion. All cut vegetation is to mulched, buried or composted on site to limit waste disposal. In areas of substantial grading, native vegetation may be harvested for possible reuse to obtain long-term soil stabilization.
- Sequence construction activities with the installation of both erosion control and sediment control measures. Arrange the construction schedule as much as practicable to leave existing vegetation undisturbed until immediately prior to grading.
- Protect slopes susceptible to erosion by installing controls (includes Visual Berm).
- Stabilize non-active areas as soon as feasible after construction is complete and no later than 14 days after construction in that portion of the site has temporarily or permanently ceased. Reapply as necessary to maintain effectiveness.
- Place covers over stockpiles prior to forecasted storm events and during windy conditions. Place sediment controls (fiber rolls or gravel bags) around the perimeter of stockpiled materials year-round.
- Maintain sufficient erosion control materials on site to allow implementation in conformance with General Permit requirements and as described in this SWPPP. This includes

implementation requirements for active areas and non-active areas that require deployment before the onset of rain.

- Repair and reapply BMPs in areas where erosion is evident as soon as possible.

During the rainy season:

- Implement temporary erosion control measures at regular intervals throughout the defined rainy season and as needed determined by site conditions.
- Inspect and stabilize disturbed areas with temporary or permanent erosion control measures before rain events.

During the non-rainy season:

- Conduct construction activities that will have an impact on waters of the United States during the dry season to the extent feasible to minimize erosion.

Attachment Q provides fact sheets on implementation of each BMP; these fact sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. A combination of the following erosion controls may be used at the site:

- EC-1, Scheduling;
- EC-2, Preservation of Existing Vegetation;
- EC-3, Straw Mulch;
- EC-9, Earth Dikes and Drainage Swales; and/or
- EC-10, Velocity Dissipation Devices.

BMPs will be deployed in a sequence to follow the progress of grading the construction. As the locations of soil disturbance change, erosion controls will be adjusted accordingly to control storm water runoff at the downgrade perimeter.

4.8.6 Sediment Control

Sediment controls are intended to complement and enhance the selection erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. The project will incorporate sediment control measures required by regulatory agency permits, contract documents, and other measures selected by the Contractor. Site-specific BMPs will be designed and are shown in **Attachment C**. **Attachment C** is to be updated as required and lists the BMPs selected for this project. **Attachment Q** contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for temporary sediment control:

Year round:

- The power block area for each phase will be graded with moderate slopes to direct runoff and diverted storm water to an infiltration/evaporation area before overflowing through native stone rip-rap to reinstate natural sheet flow conditions. Relatively small rock filters and local diversion berms through the sites will discourage water from concentrating, to maintain sheet flow. The diversions ditches and infiltration/evaporation areas will be designed to pass flow from a 100-year storm event to prevent damage to the power block and tower areas; the design will also include in its calculations storm water run-on to the site.
- Maintain the following temporary sediment control materials on site: silt fence materials, gravel bags for linear barriers, and fiber rolls in sufficient quantities.
- Throughout the project, implement temporary sediment controls in the event of predicted rain and respond to failures or emergencies, in conformance with General Permit requirements and as described in this SWPPP.
- Install gravel filter berms at the base of slopes adjacent to delineated sensitive areas (i.e., wetlands, dry washes), if any.
- Native on-site stones/rocks will be used in construction of gravel filter berms or check dams.
- Install gravel filter berms along the boundaries of delineated sensitive areas, if any, within the boundaries of the project site or receiving runoff from the project site.

During the rainy season:

During the rainy season, implement temporary sediment controls at the downstream perimeter of disturbed soil areas, at the toe of slopes, and at outfall areas.

During the non-rainy season:

During the non-rainy season, implement temporary sediment controls at the downstream perimeter of disturbed soil areas.

Attachment Q provides fact sheets on implementation of each BMP; these fact sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. A combination of the following sediment controls may be used at the site:

- SE-1, Silt Fence;
- SE-2,Sediment Basin;
- SE-4, Check Dam;
- SE-5, Fiber Rolls;
- SE-7, Street Sweeping and Vacuuming. and/or;
- SE-8, Sandbag Barrier

BMPs will be deployed in a sequence to follow the progress of grading and construction. As the locations of soil disturbance change, sedimentation controls will be adjusted accordingly to control storm water runoff at the downgrade perimeter.

4.8.7 Tracking Control

Site-specific BMPs will be designed and are shown in **Attachment C**. **Attachment C** is to be updated as required and lists the BMPs selected for this project. **Attachment Q** contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for tracking control:

Year round:

- The access roads to the project will be paved from their point of connection to Avenue M. All public roadways will be maintained to be free from dust, dirt and debris caused by construction activities. Streets will be swept at the end of the day if visible soil materials are carried onto adjacent public paved roads.
- The driving areas within the site will be clearly marked for limited speed to control dust.

Attachment Q provides fact sheets on implementation of each BMP; these fact sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. A combination of the following tracking controls may be used at the site:

- TC-1, Stabilized Construction Entrance/Exit;
- TC-2, Stabilized Construction Roadway;
- TC-3, Entrance/Outlet Tire Wash; and/or
- SE-7, Street Sweeping and Vacuuming.

4.8.8 Wind Erosion Control

Site-specific BMPs will be designed and are shown in **Attachment C**. **Attachment C** is to be updated as required and lists the BMPs selected for this project. **Attachment Q** contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for wind erosion control:

Year round:

- Minimize vehicle speed during construction to 10 miles per hour or less.
- Apply potable water (groundwater) to disturbed soil areas of the project site to control dust and maintain optimum moisture levels for compaction as needed. Apply the water using water trucks. NS-1 - Minimize water application rates as necessary to prevent runoff and ponding.
- Use a non-toxic soil stabilizer or weighting agent after grading to conserve freshwater usage.
- During windy conditions (forecasted or actual wind conditions of approximately 25 miles per hour or greater), apply dust control to disturbed areas, including haul roads, to adequately control wind erosion. Cover exposed stockpiled material areas.
- Suspend excavation and grading during periods of high winds.

- Cover all trucks hauling soil and other loose material or maintain at least two feet of freeboard.

Attachment Q provides fact sheets on implementation of each BMP; these fact sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. The following BMPs have been selected to control dust at the construction site:

- WE-1, Wind Erosion Control; and/or
- NS-1, Water Conservation Practices.

4.8.9 Non-Storm Water Control

Site-specific BMPs will be designed and are shown in **Attachment C**. **Attachment C** is to be updated as required and lists the BMPs selected for this project. **Attachment Q** contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for non-storm water control:

- Dispose of PCC and asphalt concrete waste in accordance with NS-3.
- Regularly inspect vehicles and equipment for signs of leaks. Have vehicles and equipment on a regular maintenance schedule.
- Place drip pans or absorbent materials under paving equipment when not in use. Park paving equipment over plastic to prevent soil contamination.
- Locate staging areas for construction equipment so that spills of oil grease or other petroleum by-products will not be discarded into watercourses or sensitive habitat. Protect the staging area with berms and/or dikes to prevent run on, runoff, and to contain spills.
- Fuel, clean, and maintain vehicles and other equipment only within designated areas.
- A dedicated fueling area will be protected with berms and/or dikes to prevent run on, runoff, and to contain spills. Self-propelled vehicles will be fueled off site or at the temporary fueling area. Fuel trucks will be used for on-site fueling, whether at the temporary fueling area or for mobile fueling elsewhere on the site. Drip pans will be used for mobile fueling. Each fuel truck will be equipped with absorbent spill cleanup materials and a spill containment boom at all times.
- Drip pans or absorbent pads will be used for vehicle and equipment maintenance activities that involve grease, oil, solvents, or other vehicle fluids.
- Machinery will be properly maintained and cleaned to prevent spills and leaks.
- Inform workers of the importance of preventing spills and measures to take should a spill occur. Clean up spills immediately in accordance with applicable local, state, or federal regulations. Such spills will be reported in the post-construction compliance reports.
- Use proper storage and handing techniques for concrete curing compounds.
- Clean off-site vehicles that regularly enter and leave the site.
- Inspect all vehicles and equipment for leaks before coming on-site.

Attachment Q provides fact sheets on implementation of each BMP; these fact sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. An inventory of construction activities and potential non-storm water discharges is provided in **Section 4.5.2**. The BMP consideration checklist in **Attachment C** and the following list indicates the BMPs that have been selected to control non-storm water pollution on the construction site. Implementation and locations of some non-storm water control BMPs are shown on the Erosion Control Drawings in **Attachment B**. An additional narrative and pictorial description of each BMP is presented in **Attachment Q**.

A combination of the following non-storm water controls may be used at the site:

- NS-1, Water Conservation Practices;
- NS-3, Paving and Grinding Operations;
- NS-6, Illicit Connection/Illegal Discharge Detection and Reporting;
- NS-7, Potable Water/Irrigation;
- NS-8, Vehicle and Equipment Cleaning;
- NS-9, Vehicle and Equipment Fueling;
- NS-10, Vehicle and Equipment Maintenance;
- NS-12, Concrete Curing; and
- NS-13, Concrete Finishing.

4.8.10 Waste Management and Materials Pollution Control

The project will incorporate waste management and materials pollution control measures required by contract documents, supplemented with our measures selected by the Contractor as needed to meet general Permit objectives. Site-specific BMPs will be designed and are shown in **Attachment C**. **Attachment C** is to be updated as required and lists the BMPs selected for this project. **Attachment Q** contains BMP fact sheets with applicable detailed descriptions of suitability, implementation, and inspection and maintenance measures. At a minimum, this project will implement the following practices for waste management and materials pollution control:

Year round:

In general, implement BMPs WM-1 and WM-2 to help prevent discharges of construction materials during delivery, storage, and use. Provide the following types of storage/containment facilities to minimize storm water contact with construction materials:

1. Use a watertight container to store hand tools and other items such as small parts.

Provide cover and secondary containment for any stored hazardous materials. Store hazardous materials in appropriate containers.

a. Temporary containment facilities for hazardous materials should provide for a spill containment volume able to contain precipitation from a 25-year storm event, plus 10 percent of the aggregate volume of all containers or 100 percent of the capacity of the largest container within its boundary, whichever is greater. It should be impervious to the materials stored therein for a minimum contact time of 72 hours.

Store large non-hazardous items, such as framing materials, in the general storage area. Elevate such materials with wood blocks to minimize contact with storm water. Prevent run-on (i.e., with earthen dike, trench) into the general storage area.

Inspect storage areas for signs of spills and/or leakage.

Handle and dispose of hazardous wastes in accordance with applicable laws, ordinances, regulations, and standards, and CEC conditions of certification, including licensing, personnel training, accumulation limits and times, and reporting and recordkeeping.

Collect hazardous wastes in satellite accumulation containers near the points of generation. Store hazardous wastes in appropriate and clearly marked containers and segregate from other non-waste materials. Move used waste containers daily to the Contractor's 90-day hazardous waste storage area, located at the site construction lay down area. Provide cover and secondary containment for the hazardous waste storage area. Remove the waste from the site by a certified hazardous waste collection company and deliver to an authorized hazardous waste management facility, prior to expiration of the 90-day storage limit.

In the unlikely event that even larger volumes of potentially hazardous material must be temporarily held awaiting disposition, a containment area will be constructed. Plastic sheeting will be laid on the ground prior to placement of the contaminated material and the material itself will be covered.

Store only enough products required to do the job.

Keep products in their original containers with the original manufacturer's label.

Follow manufacturers' recommendations for the storage, use and disposal of all materials.

At a minimum, follow the following practices for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Maintain spill cleanup materials, material safety data sheets, a material inventory, and emergency contact numbers in all storage areas.
- Spill cleanup materials should include at a minimum: 1) absorbent materials (granular, socks, pillows), 2) tools to manage/contain smaller spills such as brooms/shovels/rakes/squeegees, 3) a spill-berm that would hold the amount of the largest container, 4) appropriate, water-tight disposal containers for used spill cleanup materials, and 5) personal protective gear.
- Clean up spills immediately after discovery.
- Keep spill area well ventilated.
- The Project Manager (or designee) will be the Spill Prevention and Cleanup Coordinator. The names of additional responsible spill personnel and authorized Contractors will be posted in various areas.

- Report spills of toxic or hazardous materials to the Project Manager (or designee), regardless of the size.
- Report spills of hazardous materials that exceed their reportable quantities to all appropriate local, state and federal government agencies. The Project Manager (or designee) will be responsible for investigating spills and determining whether the reportable quantity has been exceeded. Regulations defining the reportable quantity levels for oil and hazardous substances are found in Title 40, Code of Federal Regulations, Part 110, Part 117 or Part 302.
- Place covers over stockpiles prior to forecasted storm events and during windy conditions. Place sediment controls at the foot of stockpiled materials.
- Load solid wastes directly into trucks for off-site disposal. When on-site storage is necessary, store solid wastes in watertight covered dumpsters in the general storage area. Have licensed waste hauler move solid waste at least weekly and dispose of off site.
- Provide weekly maintenance for portable toilets by a licensed sanitary service and dispose of wastes off site.
- Locate portable toilets away from concentrated flow paths and traffic flow.
- Anchor portable toilets during periods of heavy winds.
- Establish concrete washout area in accordance with WM-8.

Attachment Q provides fact sheets on implementation of each BMP; these fact-sheets will be referenced for suitable applications, limitations, and implementation (specifications), inspection, and maintenance measures for each selected BMP. A combination of the following waste management and materials pollution controls may be used at the site:

- WM-1, Material Delivery and Storage;
- WM-2, Material Use;
- WM-3, Stockpile Management;
- WM-4, Spill Prevention and Control;
- WM-5, Solid Waste Management;
- WM-6, Hazardous Waste Management;
- WM-8, Concrete Waste Management;
- WM-9, Sanitary/Septic Waste Management; and/or
- WM-10, Liquid Waste Management.

4.8.11 Contaminated Soil

Although there is no known contaminated soil at the project site, it may be possible that contaminated soil is encountered during construction. Operators and construction personnel will be trained on the identification of contaminated soils and will be asked to report unusual conditions to an approved registered geologist. If soils require temporary stockpiling, piles will be placed on plastic sheeting, covered with plastic sheeting or tarp, secured safely with gravel bags and bermed with fiber rolls or silt fencing to prevent runoff from leaving the area. If required, samples will be collected and sent to a certified analytical laboratory for characterization. If contamination is detected, the waste will be handled accordingly and properly disposed of at an authorized waste management facility.

4.9 Personnel Training

All site personnel and personnel responsible for implementing this SWPPP have completed Construction Storm Water Management training. Training records are maintained with the SWPPP in the construction management office.

4.10 Qualified Storm Water Pollution Prevention Plan Practitioner

The QSP assigned to this project is:

QSP's Name: To be determined.

QSP's Telephone/Cell Number: To be determined

Company Name: To be determined

Address: To be determined

City, State Zip: To be determined

Telephone: To be determined

The QSP shall have primary responsibility and significant authority for the implementation, maintenance, inspection and amendments to the approved SWPPP. The QSP will be available at all times throughout the duration of the project. The QSP will meet the minimum requirements as listed in the permit. Effective two years from July 1, 2010 the QSP will have one of the certifications listed in the General Permit and shall have attended a State Water Board-sponsored or approved QSP training course.

Duties of the QSP include but are not limited to:

- Ensuring full compliance with the SWPPP and the Permit;
- Implementing all elements of the SWPPP, including but not limited to:
  - Implementation of prompt and effective erosion and sediment control measures; and
  - Implementing all non-storm water management, and materials and waste management activities such as: monitoring discharges (dewatering, diversion devices); general site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities that will have an adverse effect on receiving waters or storm drain systems; etc.
- Pre-storm inspections;
- Post-storm inspections;
- Storm event inspections;
- Preparing annual compliance certification;

- Ensuring elimination of all unauthorized discharges;
- Mobilizing crews in order to make immediate repairs to the control measures;
- Coordinating with the Engineer to assure all of the necessary corrections/repairs are made immediately, and that the project complies with the SWPPP, the Permit and approved plans at all times; and
- Submitting Notices of Non-Compliance reports and reports of Illicit Connections or Illegal Discharges.

4.11 Other Plans

If petroleum products are stored on site above the threshold quantity, a Spill Prevention Countermeasures and Control (SPCC) Plan will be prepared and implemented by the appropriate (sub) contractor.

Additional plans or permits applicable to the SWPPP will be placed in **Attachment N** once they are obtained for the project

5.0 Monitoring and Reporting Program

5.1 Site Inspections

The contractor will inspect the site as follows:

- Prior to a forecast storm ;
- Within 24 hours after every rainfall;
- At 24-hour intervals during extended rain events;
- Weekly during the rainy season;
- Monthly during the non-rainy season; and
- At any other intervals as specified in the contract documents.

The results of all inspections and assessments will be documented, a copy shall be provided to the Site Engineer within 24 hours of the inspection, and copies of the completed inspection checklists will be maintained with the SWPPP. Guidance regarding site inspections is provided in **Attachments G** and **L**. Site inspections conducted for monitoring purposes will be performed using the inspection checklist shown in **Attachment H**.

The name(s) and contact number(s) of the assigned inspection personnel are listed below:

[*Contractor to insert details in an amendment: Inspector name and contact number*]

Assigned inspector:
Contact phone number:

Assigned inspector:
Contact phone number:

5.2 Discharge Reporting

If a discharge occurs or if the project receives a written notice or order from any regulatory agency, the contractor will immediately notify the City of Palmdale, and will file a written report to the City of Palmdale within 7 days of the discharge event, notice, or order.

Corrective measures will be implemented immediately following the discharge, notice or order. A sample Notice of Non-Compliance form is provided in **Attachment K**. All discharges shall be documented on a Discharge Reporting Log using the form in **Attachment T**.

Discharges requiring reporting include:

- Storm water discharged to a receiving water without treatment by a temporary construction BMP;

- Non-storm water, except conditionally exempted discharges, discharged to any surface water, or a storm drain system, without treatment by an approved control measure (BMP);
- Storm water discharged to a storm drain system where the control measures (BMPs) have been overwhelmed or not properly maintained or installed;
- Storm water runoff containing hazardous substances from spills discharged to the storm drain system; and
- Other discharge reporting as directed by the City of Palmdale.

The report to the City of Palmdale will contain the following items:

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

5.3 Recordkeeping and Reports

Records shall be retained for a minimum of three years for the following items:

- Site inspections,
- Compliance certifications,
- Discharge reports, and
- Approved SWPPP document and amendments.

5.4 Annual Compliance Certification

By September 1 of each year, the City of Palmdale shall submit an Annual Certification of Compliance to Lahontan Regional Water Quality Control Board (RWQCB) stating compliance with the terms and conditions of this Permit and the SWPPP covering the preceding date of September 1 up to August 30. The annual certification of compliance form is included in **Attachment M**. Completed forms will also be located in **Attachment M** of the Site copy of the SWPPP.

5.5 Sampling and Analysis Plan for Sediments

This project does not have the potential to discharge directly to a water body listed as impaired due to Sedimentation/Siltation and/or Turbidity pursuant to Clean Water Act, Section 303(d), therefore a sampling and Analysis Plan for Sedimentation is not required.

If however the site does have a discharge of storm water, the Sampling and Analysis Plan found in **Attachment J** will be followed.

6.0 Amendments

6.1 SWPPP Amendment Certification and Approval

This SWPPP shall be amended:

- Whenever there is a change in construction or operations that may affect the discharge of pollutants to surface waters, groundwater, or a municipal separate storm sewer system (MS4);
- If any condition of the Permit(s) is violated or the general objective of reducing or eliminating pollutants in storm water discharges has not been achieved. If the RWQCB determines that a Permit violation has occurred, the SWPPP shall be amended and implemented within 14-calendar days after notification by the RWQCB; or
- When deemed necessary by the Engineer for the City of Palmdale or the Contractor.

The following items will be included in each amendment:

- Who requested the amendment.
- The location of proposed change.
- The reason for change.
- The original BMP proposed, if any.
- The new BMP proposed.

The amendments for this SWPPP, along with the Contractor's Certification and the City of Palmdale Approval form are provided in the following pages. Amendments to the SWPPP should be documented in the SWPPP Amendment log. A sample form is presented in **Attachment O.** All approved SWPPP Amendment Certifications and Amendments shall be kept in the Site copy of the SWPPP.

SWPPP Amendment Certification

Amendment No. __

Project Name: Palmdale Hybrid Power Project (PHPP)

To be completed by Contractor

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Contractor's Signature	Date
Contractor's Name and Title	Telephone Number

For City of Palmdale Use Only

City of Palmdale Approval and Certification of the Storm Water Pollution Prevention Plan Amendment

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

City of Palmdale Signature	Date
City of Palmdale Name and Title	Telephone Number

.

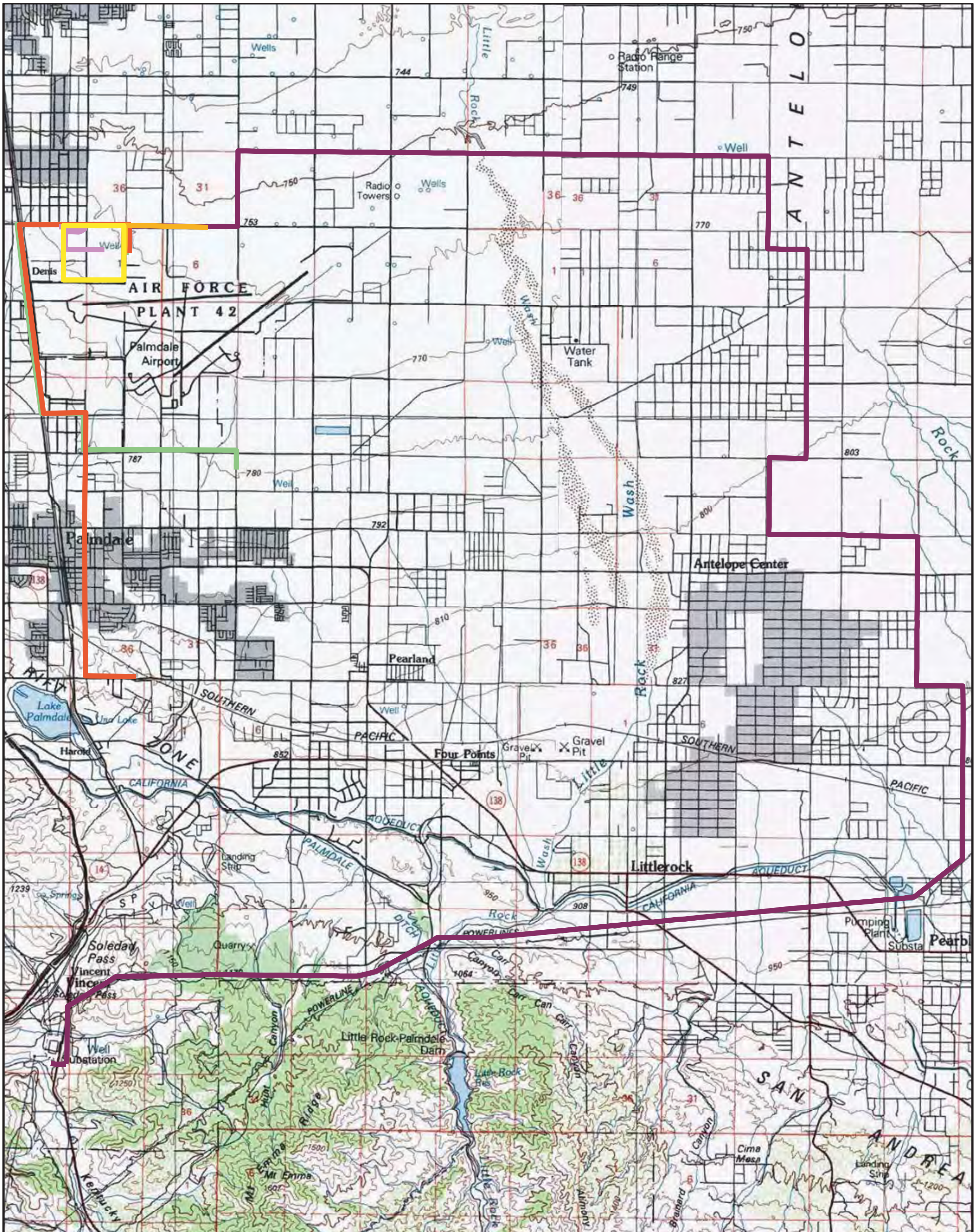
7.0 References

The following documents are made a part of this SWPPP by reference:

- State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System General Permit (NPDES) No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity, September 2, 2009 (Statewide Construction Permit).
- California Stormwater Quality Association Stormwater Best Management Practices Handbook, January, 2003 (CASQA BMPs Manual).
- Kleinfelder, Report of Geotechnical Investigation
- Preliminary Draft DESCP, Palmdale Hybrid Power Plant, KPE July 23, 2008

Attachment A

Vicinity Map



Legend

- Transmission Line
- Reclaimed Water Pipeline
- Natural Gas Supply Line
- Potable Water
- Power Plant Site
- Sanitary Wastewater Pipeline

Palmdale Hybrid Power Project

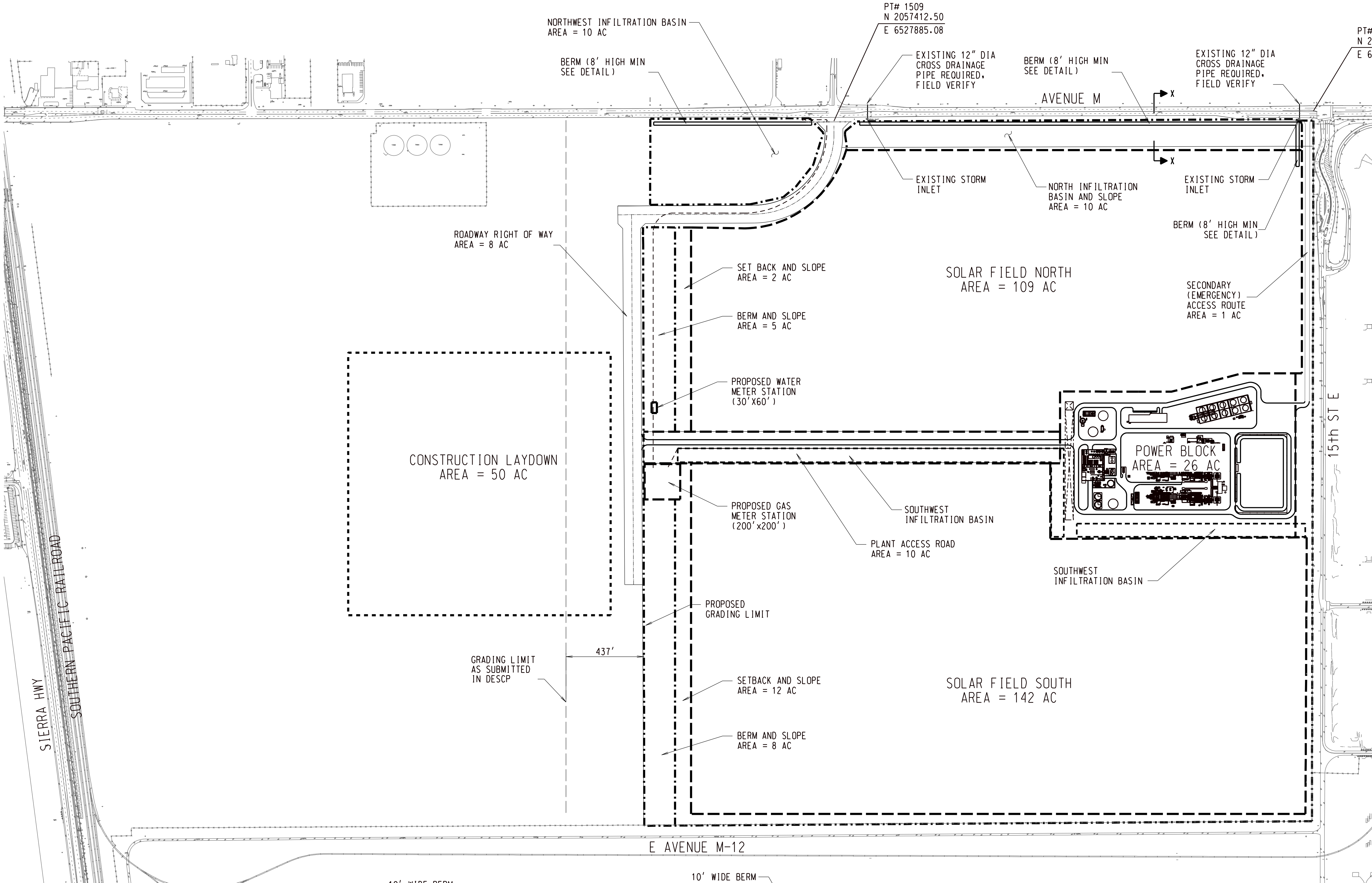
0 0.5 1 2 Miles

1:110,000

Map Notes:
Projection: NAD 83, Zone 11
Path:G:\sdo8\bio\Palmdale\mxd\sspecies Power Plant Bio 6554000247\graphics\mxd
Date: 03/19/2009

amec

Figure 1



NOTES:

1. STACK COORDINATES-

HRSG 1:
STATE PLANE GROUND COORDINATE
N: 2055300.000
E: 6529671.000

GEOGRAPHIC COORDINATE (NAD 83)
LATITUDE: 34 38 23.91803
LONGITUDE: 118 06 22.94693

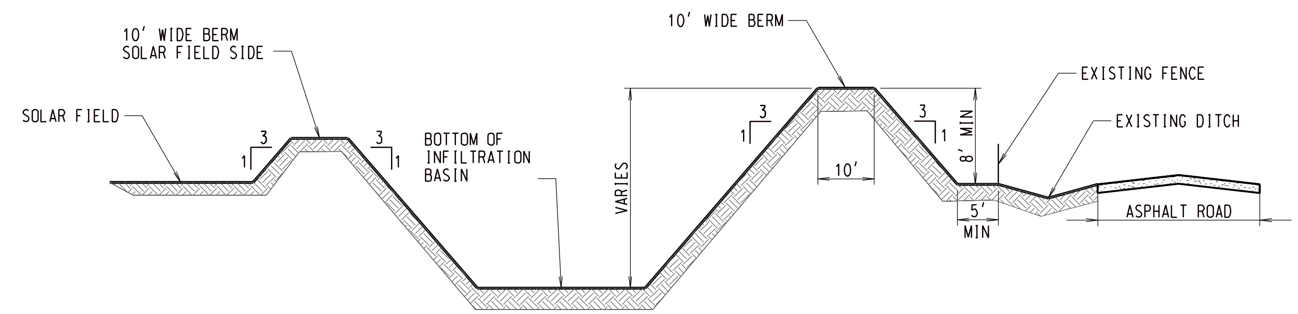
BASE ELEVATION: 2517

HRSG 2:
STATE PLANE GROUND COORDINATE
N: 2055435.000
E: 6529671.000

GEOGRAPHIC COORDINATE (NAD 83)
LATITUDE: 34 38 25.25346
LONGITUDE: 118 06 22.94864

BASE ELEVATION: 2517

- PRELIMINARY -
NOT FOR CONSTRUCTION



SECTION X-X BERM ALONG AVENUE M AND WEST OF SECONDARY ACCESS ROUTE
SCALE: NTS

300 0 300 600
SCALE IN FEET
SCALE: 1" = 300'

N

REV	DESCRIPTION	DWN	CHK	APP	DATE
D	ADDED BERM WEST OF SECONDARY ACCESS ROUTE	SJM			03-11-10
C	CORRECTED COORDINATE	SMC			02-17-10
B	ADDED BERM DETAIL	MTW			07-30-09
A	ISSUE FOR REVIEW	MTW			04-15-09

CITY OF PALMDALE

PALMDALE HYBRID
POWER PROJECT

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

CONCEPTUAL SITE LAYOUT

	by	date
DESIGNED	MDM	01-06-09
DRAWN	MDM	01-06-09
CHECKED		
APPROVED		

DRAWING NUMBER
2007-021-CM-500

Attachment B

Erosion Control Drawings

(Not Included in the Preliminary SWPPP)

Attachment C

BMP Consideration Checklist

ATTACHMENT C
BMP Consideration Checklist

The BMPs listed here should be considered for every project. Those BMPs that are not included in the SWPPP must be checked as “Not Used” with a brief statement describing why it is not being used.

EROSION CONTROL BMPs

BMP No.	BMP	Considered For Project	Check If Used	Check If Not Used	If Not Used, State Reason
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		May be Used
EC-3	Hydraulic Mulch	✓	✓		May be Used
EC-4	Hydroseeding	✓		✓	Using Other Measures as Primary means of Erosion Control
EC-5	Soil Binders	✓	✓		
EC-6	Straw Mulch	✓		✓	Using Other Measures as Primary means of Erosion Control
EC-7	Geotextiles & Mats	✓		✓	Using Other Measures as Primary means of Erosion Control
EC-8	Wood Mulching	✓		✓	Using Other Measures as Primary means of Erosion Control
EC-9	Earth Dikes & Drainage Swales	✓	✓		May be Used
EC-10	Velocity Dissipation Devices	✓	✓		May be Used
EC-11	Slope Drains	✓		✓	Not Applicable
EC12	Streambank Stabilization	✓		✓	Not Applicable

ATTACHMENT C
BMP Consideration Checklist

The BMPs listed here should be considered for every project. Those BMPs that are not included in the SWPPP must be checked as “Not Used” with a brief statement describing why it is not being used.

SEDIMENT CONTROL BMPs

BMP No.	BMP	Considered For Project	Check If Used	Check If Not Used	If Not Used, State Reason
SE-1	Silt Fence	✓	✓		
SE-2	Sediment Basin	✓	✓		
SE-3	Sediment Trap	✓		✓	Using Other Measures as Primary means of Sediment Control
SE-4	Check Dam	✓	✓		May be used.
SE-5	Fiber Rolls	✓	✓		May be used.
SE-6	Gravel Bag Berm	✓		✓	Using Other Measures as Primary means of Sediment Control
SE-7	Street Sweeping and Vacuuming	✓	✓		
SE-8	Sandbag Barrier	✓	✓		May be used..
SE-9	Straw Bale Barrier	✓		✓	Using Other Measures as Primary means of Sediment Control
SE-10	Storm Drain Inlet Protection	✓		✓	Not Applicable
SE-11	Chemical Treatment	✓		✓	Not Applicable

WIND EROSION CONTROL BMPs

WE-1	Wind Erosion Control	✓	✓		

TRACKING CONTROL BMPs

TC-1	Stabilized Construction Entrance/Exit	✓	✓		
TC-2	Stabilized Construction Roadway	✓	✓		
TC-3	Entrance/Outlet Tire Wash	✓	✓		

ATTACHMENT C
BMP Consideration Checklist

The BMPs listed here should be considered for every project. Those BMPs that are not included in the SWPPP must be checked as “Not Used” with a brief statement describing why it is not being used.

NON-STORM WATER MANAGEMENT BMPS

BMP No.	BMP	Considered For Project	Check If Used	Check If Not Used	If Not Used, State Reason
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operations	✓		✓	Not Applicable
NS-3	Paving and Grinding Operations	✓	✓		
NS-4	Temporary Stream Crossing	✓		✓	Not Applicable
NS-5	Clear Water Diversion	✓		✓	Not Applicable
NS-6	Illicit Connection/ Discharge	✓	✓		
NS-7	Potable Water/Irrigation	✓	✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operations	✓		✓	Not Applicable
NS-12	Concrete Curing	✓	✓		
NS-13	Concrete Finishing	✓	✓		
NS-14	Material and Equipment Use Over Water	✓		✓	Not Applicable
NS-15	Demolition Adjacent to Water	✓		✓	Not Applicable
NS-16	Temporary Batch Plants	✓		✓	Not Applicable

ATTACHMENT C
BMP Consideration Checklist

The BMPs listed here should be considered for every project. Those BMPs that are not included in the SWPPP must be checked as “Not Used” with a brief statement describing why it is not being used.

WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPS

BMP No.	BMP	Considered For Project	Check If Used	Check If Not Used	If Not Used, State Reason
WM-1	Material Delivery and Storage	✓	✓		
WM -2	Material Use	✓	✓		
WM -3	Stockpile Management	✓	✓		
WM -4	Spill Prevention and Control	✓	✓		
WM -5	Solid Waste Management	✓	✓		
WM -6	Hazardous Waste Management	✓	✓		
WM -7	Contaminated Soil Management	✓		✓	Contaminated soil issues were addressed during the Geotechnical Investigation
WM -8	Concrete Waste Management	✓	✓		
WM -9	Sanitary/Septic Waste Management	✓	✓		
WM -10	Liquid Waste Management	✓	✓		

Attachment D

Computation Sheet for Determining Risk Factors

Palmdale Hybrid Power Project
Risk Determination Worksheet for Project Site
Avenue M , Palmdale, CA
STEP A Determine Rainfall (R) Factor,

Latitude	34 38' 39.27"	N
Longitude	118 07' 30.76"	W

Erosivity Index **36.02** **R**
(derived from NPDES calculator using a 3 year disturbance to stabilization period)

STEP B Determine Soil-erodibility (K) Factor, weighted average by area for all soils)
Soil Erodibility Factor
(Using nomograph)

Site Sample Identificati	Gradation Analysis (% Passing)		K
SMP #1	15%	Silt	0.20
	85%	Sand	
	0%	Clay	
SMP #2	25%	Silt	0.28
	75%	Sand	
	0%	Clay	

Soil Erodibility factor **0.24** Average of the above

STEP C Determine Length Slope (LS) Factor, weighted average by area for all slopes

Sheet Flow Length (feet)	Average Watershed Slope (%)	
	0.5	1
1000	0.13	0.27
2500	0.325	0.675

Source of the above information is the LS Table

Actual Slope (%) 0.6
Interpolated LS 0.395
Length-slope factor **0.395**

STEP D Determine Cover (C) Factor,
Cover factor (erosion controls) **1** **C**
(bare ground conditions = 1.0)

STEP E Determine Management Ops and Support Practices (P) Factor
Management Ops & Support Practices **1** **P**
(bare ground conditions = 1.0)

CALCULATE SEDIMENT RISK FACTOR
From 2009-0009-DWQ Appendix 1,
Watershed Erosion Estimate in tons/acre is equal to
A = R x K x LS x C x P
A= 36.02 x0.24x 0.395 x1 x1 = **3.41** A
Since the Sediment Risk is LESS THAN 15 tons/acre,
Low Sediment Risk

Palmdale Hybrid Power Project
Risk Determination Worksheet for Transmission Line (LUP)

STEP A Determine Rainfall (R) Factor,

Latitude	34 29' 24"	N		
Longitude	118 03' 49"	W		
Erosivity Index			**51.02**	**R**

(derived from NPDES calculator using a 3 year disturbance to stabilization period)

STEP B Determine Soil-erodibility (K) Factor * Length Slope Factor (LS) from USEPA EMAP Risk Figure
(Figure 1 of NPDES General Permit Fact Sheet)

K*LS **0.8**

STEP C Determine Cover (C) Factor,
Cover factor (erosion controls) **1** **C**
(bare ground conditions = 1.0)

STEP D Determine Management Ops and Support Practices (P) Factor
Management Ops & Support Practices **1** **P**
(bare ground conditions = 1.0)

CALCULATE SEDIMENT RISK FACTOR
From 2009-0009-DWQ Appendix 1,
Watershed Erosion Estimate in tons/acre is equal to
A = R x K x LS x C x P
A= 51.02 x0.8 x1 x1 = **40.82** A
Since the Sediment Risk is LESS THAN 75 tons/acre, but greater than 15 tons/acre,
Medium Sediment Risk

Attachment E

Water Balance Computation Sheet

(Not Included in the Preliminary SWPPP)

Attachment F

Notice of Intent (NOI)

(Not Included in the Preliminary SWPPP)

Attachment G

Program for Maintenance, Inspection, and Repair of Construction Site BMPs

The Contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP:		
BEST MANAGEMENT PRACTICES (BMPs)	**INSPECTION FREQUENCY (all controls)**	**MAINTENANCE/REPAIR PROGRAM**
TEMPORARY EROSION CONTROL BMPs		
EC-1 Scheduling	Prior to the start of rainy season	■ Review the Project Schedule. Revise construction activities, if possible, and implement appropriate construction site BMPs.
EC-2 Preservation Of Existing Vegetation		■ Ensure vegetation outside of the clearing limits remain undisturbed. Revive vegetation as necessary.
EC-4 Hydroseeding		■ Reapply the selected hydroseeding product as needed for proper effectiveness.
EC-4 Hydroseeding EC-7 Geotextiles and Mats EC-8 Wood Mulching		■ If washout or breakage occurs, or if material has been blown off the area requiring protection, re-install the material after repairing any damage to the protected area.
EC-9 Earth Dikes/Drainage Swales and Lined Ditches EC-10 Velocity Dissipation Devices EC-11 Slope Drains		■ Inspect ditches and berms for erosion and the accumulation of debris and sediment. Remove debris and sediment, and repair damaged linings or soil stabilizers as needed. ■ Temporary conveyances shall be completely removed as soon as the surrounding drainage area has been adequately stabilized or at the completion of construction.
TEMPORARY SEDIMENT CONTROL BMPs		
SE-5 Fiber Rolls SE-9 Straw Bale Barrier SE-6 Gravel Bag Berms	Every other week during the rainy season Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ Repair or replace split, torn, unraveling, or slumping fiber rolls. ■ Inspect fiber rolls for sediment holding capacity. Remove retained sediments before they reach 1/3 of the barrier height. Removed sediments shall be incorporated in the project at locations acceptable to the Engineer or disposed of outside the highway right-of-way in conformance with the plans and specifications of the contract. ■ Remove fiber rolls when no longer needed.
SE-7 Street Sweeping and Vacuuming		■ Sweep tracked sediment as needed or as required by the Public Works Representative. ■ Properly dispose of sweeper wastes in conformance with the plans and specifications of the contract.

The Contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP:		
BEST MANAGEMENT PRACTICES (BMPs)	**INSPECTION FREQUENCY (all controls)**	**MAINTENANCE/REPAIR PROGRAM**
SE-4 Check Dams SE-10 Storm Drain Inlet Protection		■ Repair or replace split, torn, unraveling, or slumping sandbags. ■ Inspect sandbags for sediment holding capacity. Remove retained sediments before they reach 1/3 of the barrier height. Properly dispose of accumulated sediments. ■ Remove the sandbags and accumulated sediment when sandbags are no longer needed.
WIND EROSION CONTROL BMPs		
WE-1 Wind Erosion Control	Daily during working days	■ Check applicable areas to ensure proper coverage.
TRACKING CONTROL BMPs		
TC-1 Stabilized Construction entrance/Exit	Daily during working days Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ Remove excessive soil accumulation.
SE-7 Street Sweeping and Vacuuming		■ Sweep tracked sediment as needed. ■ Properly dispose of sweeper wastes in conformance with the plans and specifications of the contract.

The Contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP:		
BEST MANAGEMENT PRACTICES (BMPs)	**INSPECTION FREQUENCY (all controls)**	**MAINTENANCE/REPAIR PROGRAM**
NON-STORM WATER MANAGEMENT BMPs		
NS-1 Water Conservation Practices	Monthly	■ Keep watering equipment in good working condition.
NS-2 Dewatering Operations	Daily during operations	■ Inspect filtering or settling devices and repair or remove accumulated sediment once the sediment build-up prevents the structure from functioning as designed.
NS-3 Pavement and Grinding Operations	Daily during operations	■ SWPPM shall monitor concrete working tasks such as saw cutting, coring, and grinding to ensure proper pollution control practices are implemented.
NS-7 Potable Water/Irrigation	Weekly during rainy season and at two-week intervals during non-rainy season	■ Inspect irrigated areas regularly. ■ Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
NS-6 Illicit Connection/Discharge	Daily	■ Report any discharges or illicit connections.
NS-8 Vehicle and Equipment Cleaning	Regularly	■ Monitor employees and subcontractors to ensure that vehicle washing does not occur on site.
NS-9 Vehicle and Equipment Fueling NS-10 Vehicle and Equipment Maintenance	Monthly Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ Keep an ample supply of spill cleanup materials near designated areas. Personnel in charge of mobile fueling and maintenance shall have ample spill cleanup materials at all times during operations. ■ Inspect and repair damaged hoses and leaky gaskets.
NS-12 Concrete Curing	Daily during operations	■ Inspect cure containers and spraying equipment for leaks. ■ SWPPM shall monitor concrete curing operations to ensure proper pollution control practices are employed.
NS-13 Concrete Finishing	Daily during operations	■ Sweep or vacuum up debris from sandblasting at the end of each shift.

The Contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP:

BEST MANAGEMENT PRACTICES (BMPs)	INSPECTION FREQUENCY (all controls)	MAINTENANCE/REPAIR PROGRAM
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPs		
WM-1 Material Delivery and Storage	Monthly Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ Keep material storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. ■ Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function and protection. ■ Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
WM-2 Material Use	Monthly	■ Spot check employees and subcontractors to ensure appropriate practices are being employed.
WM-3 Stockpile Management	Monthly Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ Review site to ensure that stockpiles are properly protected. ■ Repair or replace plastic sheeting or sediment barrier as needed.
WM-4 Spill Prevention and Control	Monthly	■ Review spill prevention and control plans and ensure appropriate clean-up materials are on site.
WM-5 Solid Waste Management		■ Police the construction site for litter and debris. ■ Remove solid waste when containment structures are adequately filled.
WM-6 Hazardous Waste Management		■ Review hazardous waste handling and disposal procedures.
WM-8 Concrete Waste Management	Monthly Prior to forecast storm After a rain event that causes runoff from the construction site At 24-hour intervals during extended rain events	■ The SWPPM shall inspect temporary washout facilities before a concrete pour to ensure that an adequate holding capacity is provided. The holding capacity shall maintain a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Remove hardened concrete and dispose of in conformance with the plans and specifications of the contract.
WM-9 Sanitary/Septic Waste Management		■ SWPPM to ensure proper sanitary/septic procedures are being implemented. ■ Pick up and properly dispose of spills of sanitary wastes.
WM-10 Liquid Waste Management	Weekly during rainy season and at two-week intervals during non-rainy season	■ Inspect containment areas and repair or clean as necessary.

Attachment H

Storm Water Quality Construction Site Inspection Checklist

Attachment H

Storm Water Quality Construction Site Inspection Checklist

Contractor to use this form for inspecting BMPs as described in SWPPP Section 5.1.

Instructions to Contractor:

This inspection form shall be completed and signed by the Contractor's Qualified Storm Water Pollution Prevention Practioner (QSP).

The weather information shall be the best estimate of beginning of the storm event, duration of the event, time elapsed since the last storm, and approximate amount of rainfall.

List observations of all BMPs: temporary soil stabilization (erosion control), temporary sediment controls, wind erosion controls, tracking controls, non-storm water controls and waste management and materials pollution controls.

Evaluate BMPs for adequacy and proper implementation and whether additional BMPs are required in accordance with the terms of the Permits.

Verify implementation of non-storm water discharge BMPs and evaluate their effectiveness.

One-time discharges of non-storm water shall be inspected when such discharges occur.

Describe any inadequate BMPs.

Note the corrective actions required, including any changes to the SWPPP, and implementation dates.

If you answer “No” to any of the questions, describe the corrective action(s) to be taken and when the corrective action(s) are to be completed. Should you need more space to describe corrective actions, identify your response numerically and use additional sheets as necessary.

INSPECTION LOG

Date	Inspection Frequency			Inspector Signature
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	
	Pre-Storm ❑	Post-Storm ❑	Monthly ❑	

GENERAL INFORMATION				
Project Name				
Date of Inspection				
Contractor				
Inspector's Name				
Inspector's Title				
Signature				
Current Weather Conditions				
Inspection Type (Check Applicable)	❒ Prior to forecast rain ❒ 24-hr intervals during extended rain		❒ After a rain event ❒ Other ______________	
Season (Check Applicable)	❒ Rainy		❒ Non-Rainy	
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Min. Hr. Days	Approximate Rainfall Amount (mm)	

PROJECT AREA SUMMARY AND
DISTURBED SOIL AREA (DSA) SIZE LIMITS FROM SPECIAL PROVISIONS

Total Project Area ______________________________ Acres

Rainy Season DSA Limit ______________________________ Acres

Field Estimate of Active DSAs ______________________________ Acres

INSPECTION OF BMPs				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Preservation of Existing Vegetation				
Is temporary fencing provided to preserve vegetation in areas where no construction activity is planned?				
Location:				
Location:				
Location:				
Location:				

INSPECTION OF BMPs

BMP	Yes	No	N/A	Corrective Action
Erosion Control				
Does the applied temporary erosion control provide 100% coverage for the required areas?				
Are there any non-vegetated areas that may require temporary erosion control?				
Is the area where erosion controls are required free from visible erosion?				
Location:				
Location:				
Location:				
Location:				
Temporary Linear Sediment Barriers (silt fence, fiber rolls, sandbag barrier, etc.)				
Are temporary linear sediment barriers properly installed, functional and maintained?				
Are temporary linear sediment barriers free of accumulated litter?				
Is the built-up sediment less than 1/3 the height of the barrier?				
Are cross barriers installed where necessary and properly spaced?				
Location:				
Location:				
Location:				
Location:				
Location:				
Storm Drain Inlet Protection				
Are storm drain inlets internal to the project properly protected?				
Are storm drain inlet protection devices in working order and being properly maintained?				
Location:				
Location:				
Location:				
Location:				
Location:				
Sediment Basins				
Are basins designed in accordance with the requirements of the Genera Permit?				
Are basins maintained to provide the required retention/detention?				
Are basin controls (inlets, outlets, diversions, weirs, spillways, and racks) in working order?				
Location:				
Location:				
Location:				

INSPECTION OF BMPs

BMP	Yes	No	N/A	Corrective Action
Stockpiles				
Are all locations of temporary stockpiles, including soil, hazardous waste, and construction materials in approved areas?				
Are stockpiles protected from run-on, runoff from adjacent areas, and from winds?				
Are stockpiles located at least 15 m from concentrated flows, downstream drainage courses and storm drain inlets?				
Are required covers and/or perimeter controls in place?				
Location:				
Location:				
Location:				
Location:				
Concentrated Flows				
Are concentrated flow paths free of visible erosion?				
Location:				
Location:				
Location:				
Location:				
Tracking Control				
Is the entrance stabilized to prevent tracking?				
Are points of ingress/egress to public/private roads inspected and swept and vacuumed as needed?				
Are all paved areas free of visible sediment tracking or other particulate matter?				
Location:				
Location:				
Location:				
Location:				
Wind Erosion Control				
Is dust control implemented?				
Location:				
Location:				
Location:				
Location:				

INSPECTION OF BMPs				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Dewatering Operations				
Are all one-time dewatering operations covered by the General Permit inspected before and as they occur and BMPs implemented as necessary during discharge?				
Is groundwater dewatering handled in conformance with the dewatering permit issued by the RWQCB?				
Is required treatment provided for dewatering effluent?				
Location:				
Location:				
Location:				
Location:				
Vehicle & Equipment Fueling, Cleaning, and Maintenance				
Are vehicle and equipment fueling, cleaning and maintenance areas reasonably clean and free of spills, leaks, or any other deleterious material?				
Are vehicle and equipment fueling, cleaning and maintenance activities performed on an impermeable surface in dedicated areas?				
If no, are drip pans used?				
Are dedicated fueling, cleaning, and maintenance areas located at least 15 m away from downstream drainage facilities and water courses and protected from run-on and runoff?				
Is wash water contained for infiltration evaporation and disposed of outside the highway right of way?				
Is on-site cleaning limited to washing with water (no soap, soap substitutes, solvents, or steam)?				
On each day of use, are vehicles and equipment inspected for leaks, and if necessary, repaired?				
Location:				
Location:				
Location:				
Location:				
Waste Management & Materials Pollution Control				
Are material storage areas and washout areas protected from run-on and runoff, and located at least 15 m from concentrated flows and downstream drainage facilities?				
Are all material handling and storage areas clean; organized; free of spills, leaks, or any other deleterious material; and stocked with appropriate cleanup supplies?				
Are liquid materials, hazardous materials, and hazardous wastes stored in temporary containment facilities?				
Are bagged and boxed materials stored on pallets?				
Are hazardous materials and wastes stored in appropriate, labeled containers?				
Are proper storage, cleanup, and spill-reporting procedures for hazardous materials and wastes posted in open, conspicuous and accessible locations adjacent to storage areas?				
Are temporary containment facilities free of spills and rainwater?				

INSPECTION OF BMPs

BMP	Yes	No	N/A	Corrective Action
Are temporary containment facilities and bagged/boxed materials covered?				
Are temporary concrete washout facilities designated and being used?				
Are temporary concrete washout facilities functional for receiving and containing concrete waste? Are concrete residues prevented from entering the drainage system?				
Do temporary concrete washout facilities provide sufficient volume and freeboard for planned concrete operations?				
Are concrete wastes, including residues from cutting and grinding, contained and disposed of off-site or in concrete washout facilities?				
Are spills from mobile equipment fueling and maintenance properly contained and cleaned up?				
Is the site free of litter?				
Are trash receptacles provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods?				
Is litter from work areas collected and placed in watertight dumpsters?				
Are the contents of waste management receptacles properly protected from contact with storm water or from being dislodged by winds?				
Are waste management receptacles filled at or beyond capacity?				
Location:				
Location:				
Location:				
Location:				
Temporary Water Body Crossing or Encroachment				
Are temporary water body crossings and encroachments constructed properly?				
Does the project conform to the requirements of the 404 permit and/or 1601 agreement?				
Location:				
Location:				
Location:				
Location:				
Illicit Connection/Illegal Discharge Detection and Reporting				
Is there any evidence of illicit discharges or illegal dumping on the project site?				
If yes, has the Owner been notified?				
Location:				
Location:				
Location:				
Location:				

INSPECTION OF BMPs				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Discharge Points				
Are discharge points and discharge flows free from visible pollutants?				
Are discharge points free of any significant sediment transport?				
Location:				
Location:				
Location:				
Location:				
SWPPP Update				
Does the Project Schedule/Water Pollution Control Schedule of the SWPPP adequately reflect the current site conditions and Contractor operations?				
Are all BMPs shown on the WPCDs installed in the proper location(s) and according to the details in the SWPPP?				
Location:				
Location:				
Location:				
Location:				
General				
Are there any other potential water pollution control concerns at the site?				
Location:				
Location:				
Location:				
Storm Water Monitoring				
Does storm water discharge directly to an impaired water body for Sedimentation/Siltation or Turbidity as listed in the Statewide Construction Permit?				
If yes, were samples for sedimentation/siltation or turbidity collected pursuant to the sampling and analysis plan in the SWPPP?				
Were there any BMPs not properly implemented or breaches, malfunctions, leakages or spills observed which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water?				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan during the rain event?				
Were soil amendments (e.g. gypsum) used on the project?				
If yes, were samples for non-visually detectable pollutants taken pursuant to the sampling and analysis plan during the rain event?				
Did storm water contact stored materials or wastes and run off of the construction site? (Materials not in watertight containers, etc.) If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan in the SWPPP?				

Attachment I

Trained Contractor Personnel Log

Storm Water Management Training Log

Project Name: ______________________________

Contract Number: ______________________________

Storm Water Management Topic: (check as appropriate)

- ❑ Temporary Soil Stabilization
- ❑ Temporary Sediment Control
- ❑ Wind Erosion Control
- ❑ Tracking Control
- ❑ Non-storm water management
- ❑ Waste Management and Materials Pollution Control
- ❑ Storm Water Sampling

Specific Training Objective: ______________________________

Location: ____________________ Date: ____________________

Instructor: ____________________ Telephone: ____________________

Course Length (hours) ____________________

Attendee Roster (attach additional forms if necessary)

Name	Company	Phone

COMMENTS:

____

____

____

WPPP Notification

ABC Construction Inc,
123 Sunset Blvd., Suite 456
Hollywood, CA 90000

Dear Sir/Madam,

Please be advised that the following permits have been adopted to prevent the discharge of pollutants associated with construction activity from entering the storm drain system, ground and surface waters.

- Current version of the State Water Resources Control Board (SWRCB), National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ, effective July 1, 2010

[Contractor] has developed a Storm Water Pollution Prevention Plan (SWPPP) in order to implement the requirements of the Permits.

As a subcontractor, you are required to comply with the SWPPP and the Permits for any work that you perform on site. Any person or group who violates any condition of the Permits may be subject to substantial penalties in accordance with state and federal law. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP and the Permits. A copy of the Permits and the SWPPP are available for your review at the construction office. Please contact me if you have further questions.

Sincerely,

John Doe
Project Superintendent
[Contractor's Company Name]

SUBCONTRACTOR NOTIFICATION LOG

Project Name: ______________________________

Contract Number: ______________________________

SUBCONTRACTOR COMPANY NAME	CONTACT NAME	ADDRESS	PHONE NUMBER	PAGER/ FIELD PHONE	DATE NOTIFICATION LETTER SENT	TYPE OF WORK

Attachment J

Sampling And Analysis Plan

Sampling and Analysis Plan for Non-Visible Pollutants

This Sampling and Analysis Plan (SAP) for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in storm water discharges from the project site and offsite activities directly related to the project in accordance with the requirements of the General Permit.

SCOPE OF MONITORING ACTIVITY

The following construction materials, wastes or activities, as identified in **Section 5**, are potential sources of non-visible pollutants to storm water discharges from the project. Storage, use, and operational locations are shown on the Erosion Control Drawings in **Attachment B**.

- Vehicle fluids, including oil, grease, petroleum, battery acid, and coolants
- Asphaltic emulsions associated with asphalt-concrete paving operations
- Cementitious materials associated with Portland cement concrete (PCC) structures, and curb and gutters
- Base and sub-base material
- Joint and curing compounds
- Concrete curing compounds
- Paints
- Solvents, thinners, acids, glue
- Mortar mix
- Metals and plated products
- Roofing material
- General litter

With the exception of possible undiscovered or buried wastes that may remain from previous operations, the project does not contain any other existing site features with the potential to contribute non-visible pollutants to storm water discharges from the project. Use of soil amendments□stabilizers that have the potential to alter pH or have unacceptable concentrations of non-visible pollutants will be minimized on the project. However, if such products must be used because no other soil amendments□stabilizers products are available, the Engineer will be notified as to the application locations and the product will be assessed as to the potential to contribute to non-visible pollutants to storm water discharges.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or the drainage system.

MONITORING STRATEGY

Sampling Schedule

Samples for the applicable non-visible pollutant(s) and a sufficiently large uncontaminated background sample shall be collected during the first two hours of discharge from rain events resulting in a sufficient discharge for sample collection. Samples shall be collected during daylight hours (sunrise to sunset) and shall be collected regardless of the time of year, status of the construction site, or day of the week.

In conformance with the U.S. Environmental Protection Agency definition, a minimum of 72 hours of dry weather will be used to distinguish between separate rain events.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during the required inspections conducted before or during rain events:

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents storm water contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters, or a storm sewer system.
- An operational activity, including but not limited to those in Section 600.5.1, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) applicable BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters, or a storm sewer system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters, or a storm sewer system.
- Storm water runoff from an area contaminated by historical usage of the site has been observed to combine with storm water runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters, or a storm sewer system.

Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, personnel safety; and other factors. No known sampling locations have been determined. However, if a storm water inspection before or during a rain event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters, or the drainage system that was an unplanned location, and has not been identified on the WPCDs, sampling locations will be selected at that time.

If an operational activity or storm water inspection conducted 24 hours prior to or during a rain event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm sewer system that was an unplanned location and has not been identified on the WPCDs, sampling locations will be selected using the same rationale as that used to identify planned locations.

MONITORING PREPARATION

Samples on the project site will be collected by the contractor sampling personnel to be determined.

Prior to the rainy season, all sampling personnel and alternates will review the SAP. Qualifications of designated contractor personnel describing environmental sampling training and experience are provided in **Attachment I**.

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool-temperature environment and will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, surgical gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable plastic storage bags, paper towels, personal rain gear, Sharpies, ice, Sampling Activity Log forms, and Chain of Custody (COC) forms.

ANALYTICAL CONSTITUENTS

The following table lists the specific sources and types of potential non-visible pollutants on the project site and the applicable water quality indicator constituent(s) for that pollutant. **Attachment S** provides further guidance regarding potential pollutants from sources that may be used in the project construction.

Table J-1 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Pollutant Source	Pollutant	Water Quality Indicator Constituent
Joint and Curing Compounds	Acidity, Alkalinity, pH, and Volatile Organic Compounds (VOCs)	pH
Solvents	Phenols, VOCs, and Semi-Volatile Organic Compounds (SVOCs)	Phenols
Thinners	Phenols, VOCs, and SVOCs	Phenols
Acids	Acidity, pH	pH
Lead Acid Batteries	Acidity, pH	pH

Note: Vehicle fluids, oil, grease, coolant, asphaltic emulsions, paint, PCC, and plating products are considered visible pollutants and therefore are not monitored.

SAMPLE COLLECTION AND HANDLING

Sample Collection Procedures

Samples of discharge will be collected at locations where observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas have that triggered the sampling event.

Grab samples will be collected and preserved in accordance with the methods identified in **Table J-2**, Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants. Only personnel trained in proper water quality sampling will collect samples.

Samples will be collected by placing each lab-provided sample container directly into a stream of water down-gradient and within close proximity to the potential non-visible pollutant discharge location. Each separate lab-provided sample container will be filled taking care not to spill preservatives. Bottles having a septum shall be filled using zero-headspace techniques. The up-gradient and uncontaminated background samples shall be collected first prior to collecting the down-gradient to minimize cross-contamination. The sampling personnel will collect the water up-gradient of where they are standing.

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a new, clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.
- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles.
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause chemical transformation of the sample to take place.
- Decontaminate sampling equipment prior to sample collection using a non-phosphate soap water wash (e.g., Alconox), distilled water rinse, and final rinse with distilled water.
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

Sample Handling Procedures

Immediately following collection, sample bottles for laboratory analytical testing will be capped, labeled, documented on a Chain of Custody form provided by the analytical laboratory, sealed in a re-sealable plastic storage bag, placed in an ice-chilled cooler that is maintained at 4 degrees Celsius +/-2, and delivered within 24 hours to a California state-certified laboratory.

Laboratory Name: [*To be provided by the Contractor as an amendment*]

Address:

Telephone Number:

Point of Contact:

Sample Documentation Procedures

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 will not be obliterated. All corrections will be initialed and dated. Copies of the Chain of Custody form and Sampling Activity Log are provided in **Attachment R**.

Sampling and field analysis activities will be documented using the following:

- Sample Bottle Identification Labels: Sampling personnel will attach an identification label to each sample bottle. At a minimum, the following information will be recorded on the label, as appropriate:
  - Project name
  - Project number
  - Unique sample identification number and location.
  - [Project Number]-[Six digit sample collection date]-[Location]
  - (*Example:* 07-0G5304-081803-Inlet472).
  - Quality assurance/quality control (QA/QC) samples shall be identified similarly using a unique sample number or designation
  - (*Example:* 07-0G5304-081803-DUP1).
  - Collection date/time (No time applied to QA/QC samples)
  - Analysis constituent
- Sampling Activity Logs: A log of sampling events will identify:
  - Sampling date
  - Separate times for collected samples and QA/QC samples recorded to the nearest minute

- Unique sample identification number and location
- Analysis constituent
- Names of sampling personnel
- Weather conditions (including precipitation amount)
- Field analysis results
- Other pertinent data

- Chain of Custody (COC) forms: All samples to be analyzed by a laboratory will be accompanied by a COC form provided by the laboratory. Only the sample collectors will sign the COC form over to the lab. COC procedures will be strictly adhered to for QA/QC purposes.
- Storm Water Quality Construction Inspection Checklists: When applicable, the contractor's storm water inspector will document on the checklist that samples for non-visible pollutants were taken during a rain event.

SAMPLE ANALYSIS

Samples will be analyzed for the applicable constituents using the analytical methods identified in **Table J-2**, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" table in this section.

QUALITY ASSURANCE/QUALITY CONTROL

For an initial verification of laboratory or field analysis, duplicate samples will be collected at a rate of 10 percent or one duplicate per sampling event. The duplicate sample will be collected, handled, and analyzed using the same protocols as primary samples. A duplicate sample will be collected at the selected location(s) immediately after the primary sample has been collected. Duplicates will be collected where contamination is likely, not on the background sample. Duplicate samples will not influence any evaluations or conclusions; however, they will be used as a check on laboratory quality assurance.

DATA MANAGEMENT AND REPORTING

A copy of all water quality analytical results and QA/QC data will be submitted to the City of Palmdale within five days of sampling (for field analyses) and within 30 days (for laboratory analyses).

Lab reports and COCs will be reviewed for consistency between lab methods, sample identifications, dates, and times for both primary samples and QA/QC samples. All data, including COC forms, Sampling Activity Logs, and Sampling Data Reporting Forms shall be kept with the SWPPP.

DATA EVALUATION

An evaluation of the water quality sample analytical results, including figures with sample locations, will be submitted to the Resident Engineer with the water quality analytical results and the QA/QC data.

Should the runoff/down-gradient sample show an increased level of the tested analyte relative to the background sample, the BMPs, site conditions, and surrounding influences will be assessed to determine the probable cause of the increase. As determined by the site and data evaluation, appropriate BMPs will be repaired or modified to mitigate discharges of non-visual pollutant concentrations. Any revisions to the BMPs will be recorded as an amendment to the SWPPP.

CHANGE OF CONDITIONS

Whenever SWPPP monitoring, pursuant to Section B of the General Permit, indicates a change in site conditions that might affect the appropriateness of sampling locations or introduce additional non-visible pollutants of concern, testing protocols will be revised accordingly. All such revisions will be recorded as amendments to the SWPPP.

Table J-2 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
pH	EPA 150.1	1 x 100 mL	Polypropylene	Store at 4°C (record temperature at time of sampling)	Unit less	Immediate (within 15 minutes of collection)
Phenol	EPA 420.1	1 x 1 L	Glass-amber	Store at 4°C, H_2SO_4 to pH <2	0.1 mg/L	28 days
Arsenic/Potassium	EPA 200.8	1 x 250 mL	Polypropylene	Store at 4°C, Ultra HNO_3 to pH <2	0.2 µg/L – 70 µg/L	180 days
TOC	EPA 415.1	1 x 250 mL	Glass	Store at 4°C, H_2SO_4 to pH <2	0.5 mg/L	28 days

Notes:

°C	=	Degrees Celsius	mg/L	=	Milligrams per liter
EPA	=	U.S. Environmental Protection Agency	µg/L	=	Micrograms per liter
H_2SO_4	=	Sulfuric Acid	mL	=	Milliliter
HNO_3	=	Nitric Acid	TOC	=	Total Organic Carbon
L	=	Liter		=	

Attachment K

Notice of Non-Compliance

To: Date:

Subject: Notice of Non-Compliance

Project Name: ______________________________

Contract No.: ______________________________

The following instance of discharge is noted:

[Describe date, time, and location of discharge]

[Describe nature of the operation that caused the discharge]

[Describe existing BMP(s) in place prior to discharge event]

[Describe date of deployment and type of BMPs deployed after the discharge]

[Describe implementation and maintenance schedule for any affected BMPs]

If further information or a modification to the above schedule is required, notify the contact person below.

Name of Contact Person	Title
Company	Telephone Number
Signature	Date

Attachment L

SWPPP and Monitoring Program Checklist

CONSTRUCTION PROJECT: ____________________

CONTRACTOR: ____________________

CONTRACT NO.: ____________________

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

CHECK IF ADDRESSED N/A IF NOT APPLICABLE	SWPPP Section	ITEM	GENERAL PERMIT REF.	COMMENTS
✓	2	***SWPPP Certifications and Approval***	C.10	
✓	2.1	SWPPP Certification	C.10	
✓	2.2	SWPPP Approval	C.10	
✓	6	***SWPPP Amendments***	A.4.a, A.16	
✓	6.1	Amendment Certification and Approval	A.4.a, A.16	
✓	Attach. O	Amendment number and date entered into SWPPP Amendment Log	A.4.a, A.16	
✓	3	***Introduction/Project Description***	A.5	
✓	3.2	Project Description and Location (narrative)	A.5.a.1	
✓	3.3	Unique Site Features (narrative)	A.5.a.1	
	4.2	***Project Schedule Schedule (narrative or graphical)***	A.5.c.5	Will include in final
✓	7	***References***	A.14	
✓	4.4	***Vicinity Map (narrative or graphic)***	A.5.a.1	
✓	4.4	Site perimeter	A.5.a.1	
✓	4.4	Geographic features	A.5.a.1	
✓	4.6	General topography	A.5.a.1	
	4.7	***Erosion Control Drawings (graphic or narrative)***	A.5.a.2	Will include in final
	4.7	Site perimeter	A.5.a.2	Will include in final
	4.7	Existing and proposed buildings, lots, and roadways	A.5.a.2	Will include in final
	4.7	Storm water collection and discharge points	A.5.a.2	Will include in final
	4.7	General topography before and after construction	A.5.a.2	Will include in final
	4.7	Anticipated discharge location(s)	A.5.a.2	Will include in final
	4.7	Drainage patterns including the entire relevant drainage areas	A.5.a.2	Will include in final
	4.7	Temporary on-site drainage(s)	A.5.a.2	Will include in final

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

CHECK IF ADDRESSED N/A IF NOT APPLICABLE	SWPPP Section	ITEM	GENERAL PERMIT REF.	COMMENTS
✓	4.5	***Pollutant Source and BMP Identification (narrate or indicate on site map)***	A.5.b	
		Drainage	A.5.b.1	
	4.7	Drainage patterns after major grading	A.5.b.1	Will include in final
	4.7	Slopes after major grading	A.5.b.1	Will include in final
	4.7	BMPs that divert off-site drainage from passing through site	A.5.b.1	Will include in final
	4.7	***Storm Water Inlets***	A.5.b.2	
	4.7	Drainage patterns to storm water inlets or receiving water	A.5.b.2	Will include in final
✓	4.7	BMPs that protect storm water inlets or receiving water	A.5.b.2	
	3.4	***Site History (narrative; if possible, indicate location(s) on the Erosion Control Drawings)***	A.5.b	
✓	4.3	Nature of fill material and data describing the soil. Description of toxic materials treated, stored, disposed, spilled or leaked on site	A.5.b.3	
✓	4.8.10 □ 4.8.11	BMPs that minimize contact of contaminants with storm water	A.5.b.3	
✓		***Location of Areas Designated for:***	A.5.b.4	
✓	4.7 □ 4.8.10	Vehicle storage □ service	A.5.b.4	
✓	4.7 □ 4.8.10	Equipment storage, cleaning, maintenance	A.5.b.4	
✓	4.7 □ 4.8.10	Soil or waste storage	A.5.b.4	
✓	4.7 □ 4.8.10	Construction material loading, unloading, storage and access	A.5.b.4	
✓	4.7 □ 4.8.10	Areas outside of owners right-of-way (yards, borrow areas, etc.)	A.5.b.5	
✓		***BMP Locations or Descriptions for:***	A.5.b.5	
✓	4.7 □ 4.8.10	Waste handling and disposal areas	A.5.b.5	
✓	4.7 □ 4.8.10	On-site storage and disposal of construction materials and waste	A.5.b.5	
✓	4.7, 4.8.9 □ 4.8.10	Minimum exposure of storm water to construction materials, equipment, vehicles, waste	A.5.b.5	
✓	4.11	***Post-Construction BMPs***	A.5.b.6	
✓	4.11	Listing or description of post-construction BMPs	A.5.b.6	
✓	4.7	Locations of post-construction BMPs	A.5.b.6	
✓	4.9	Parties responsible for long-term maintenance	A.5.b.6	

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	**SWPPP Section**	**ITEM**	**GENERAL PERMIT REF.**	**COMMENTS**
✓		***Additional Information***	A.5.c	
✓	4.8.1 □ 4.8.2	Description of other pollutant sources and BMPs	A.5.c.1	
✓	4.8.3	Pre-construction control practices	A.5.c.1	
✓	4.8.2	Inventory of materials and activities that may pollute storm water	A.5.c.2	
✓	4.8.10 □ 4.8.11	BMPs to reduce□eliminate potential pollutants listed in the inventory	A.5.c.2	
	Attach. F	Copy of the NOI	A.5.c.4	Will include in final
	4.2	Construction activity schedule	A.5.c.4	Will include in final
✓	Title Page	Contact information	A.5.c.5	
✓	4.8	**SOIL STABILIZATION (EROSION CONTROL)**	A.6	
✓		***The SWPPP shall include:***	A.6.a-c	
✓	3.3	Areas of vegetation on site	A.6.a.1	
✓	4.8.1	Areas of soil disturbance that will be stabilized during rainy season	A.6.a.2	
	4.8.1	Areas of soil disturbance which will be exposed during any part of the rainy season	A.6.a.3	Will include in final
✓	4.2	Implementation schedule for erosion control measures	A.6.a.4	
✓	4.8.5	BMPs for erosion control	A.6.b	
✓	4.8.8	BMPs to control wind erosion	A.6.c	
✓	4.8.6	**SEDIMENT CONTROL**	A.8	
✓	4.7 □ 4.8.6	Description□Illustration of BMPs to prevent increase of sediment load in discharge	A.8	
✓	4.2 □ 4.8.6	Implementation schedule for sediment control measures	A.8	
✓	4.8.7	BMPs to control sediment tracking	A.8	
✓	4.8.9 □ 4.8.10	**NON-STORM WATER MANAGEMENT**	A.9	
✓	4.8.9 □ 4.8.10	Description of non-storm water discharges to receiving waters	A.9	
✓	4.8.9 □ 4.8.10	Locations of discharges	A.9	
✓	4.8.9 □ 4.8.10	Description of BMPs	A.9	
	4.10	Name and phone number of person responsible for non-storm water management	A.9	Will include in final
	4.8.11	**POST-CONSTRUCTION**	A.10	Will include in final
	4.8.11	Description of post-construction BMPs	A.10	Will include in final
	4.8.11	Operation□Maintenance of BMPs after project completion (including short-term funding, long-term funding and responsible party)	A.10	Will include in final

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	**SWPPP Section**	**ITEM**	**GENERAL PERMIT REF.**	**COMMENTS**
✓	5.1	**MAINTENANCE, INSPECTIONS, AND REPAIR**	A.11	
	Title Page, 5.1	Name and phone number of person(s) responsible for inspections	A.11	Will include in final
✓	5.1, Attach. H	Complete inspection checklist: date, weather, inadequate BMPs, visual observations of BMPs, corrective action, inspector's name, title, signature	A.11.a-f	
		OTHER REQUIREMENTS	A.12-16	
	4.9	Documentation of all training	A.12	Will include in final
	4.10	List of Contractors/Subcontractors	A.13	Will include in final

SECTION B: STANDARD PROVISIONS FOR CONSTRUCTION ACTIVITIES				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	**SWPPP Section**	**ITEM**	**GENERAL PERMIT REF.**	**COMMENTS**
✓	5.1	Description of Site Inspection Plans	B.3	
✓	5.4	Annual Compliance Certification (July 1)	B.4	
✓	5.2	Discharge Reporting	B.5	
✓	5.3	Keep records of all inspections, compliance certifications, and discharge reporting for a period of three years	B.6	
N/A	5.5	Sampling and Analysis Plan for Sediment	B.7	
✓	Attach J	Sampling and Analysis Plan for Non-Visible Pollutants	B.8	

SECTION C: STANDARD PROVISIONS FOR CONSTRUCTION ACTIVITIES				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	**SWPPP Section**	**ITEM**	**GENERAL PERMIT REF.**	**COMMENTS**
	2.1	Signed SWPPP Certification	C.9, 10	Will include in final

Attachment M

Annual Certification of Compliance Form

Annual Certification of Compliance

Project Name: ______________________________

Contract No.: ______________________________

Contractor Company Name: ______________________________

Contractor Address: ______________________________

Construction Start Date: ______________ **Completion Date:** ______________

Description of Work:

Work Now in Progress:

Work Planned for Next 12 Months:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

______________________________ ______________

Contractor's Signature Date

Attachment N

Permits

(Not Included in the Preliminary SWPPP)

Attachment O

SWPPP Amendments

SWPPP Amendment Log

Project Name: Palmdale Hybrid Power Project (PHPP)

Amendment No.	Date	Brief Description of Amendment	Prepared By

Attachment P

Notice of Termination (NOT)

(Not Included in the Preliminary SWPPP)

Attachment Q

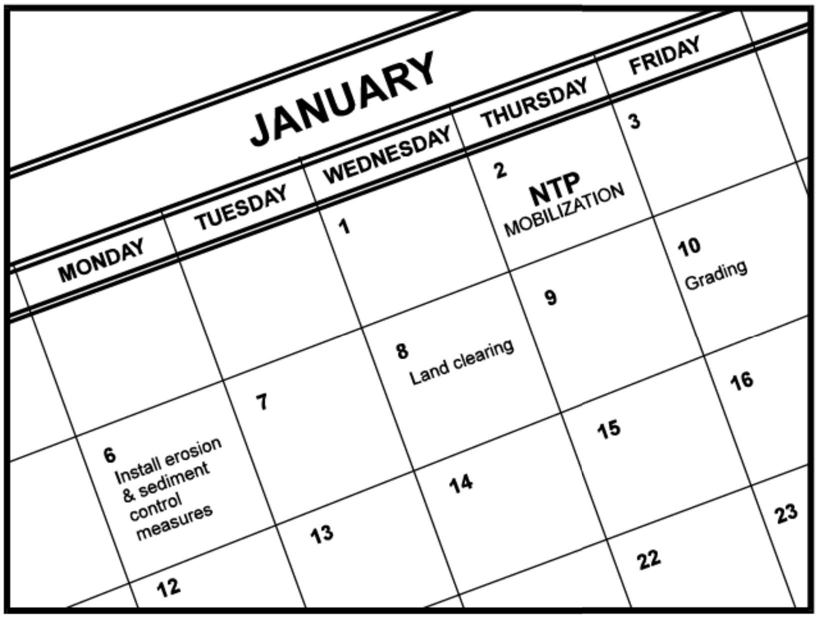
BMPs Selected for the Project

The California Stormwater Quality Association (CASQA) Best Management Practices (BMP) Handbook was used to develop this SWPPP. This document may be accessed electronically at http://www.cabmphandbooks.net/Construction.asp. Tear sheets for the BMPs are listed at this website address.

BMPs that were selected for the project include:

EC-1	Scheduling
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch
EC-4	Hydroseeding
EC-5	Soil Binders
EC-9	Earth Dikes and Drainage Swales
EC-10	Velocity Dissipation Devices
SE-1	Silt Fencing
SE-2	Sediment Basin
SE-4	Check Dams
SE-5	Fiber Rolls
SE-7	Street Sweeping and Vacuuming
SE-8	Sandbag Barrier
WE-1	Wind Erosion Control
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
TC-3	Entrance/Outlet Tire Was
NS-1	Water Conservation Practices
NS-3	Paving and Grinding Operations
NS-6	Illicit Connection/Discharge
NS-7	Potable Water/Irrigation
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle and Equipment Fueling

NS-10	Vehicle and Equipment Maintenance
NS-12	Concrete Curing
NS-13	Concrete Finishing
WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-8	Concrete Waste Management
WM-9	Sanitary/Septic Waste Management
WM-10	Liquid Waste Management



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

Limitations

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

Implementation

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

- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil

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disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

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

Costs

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

Inspection and Maintenance

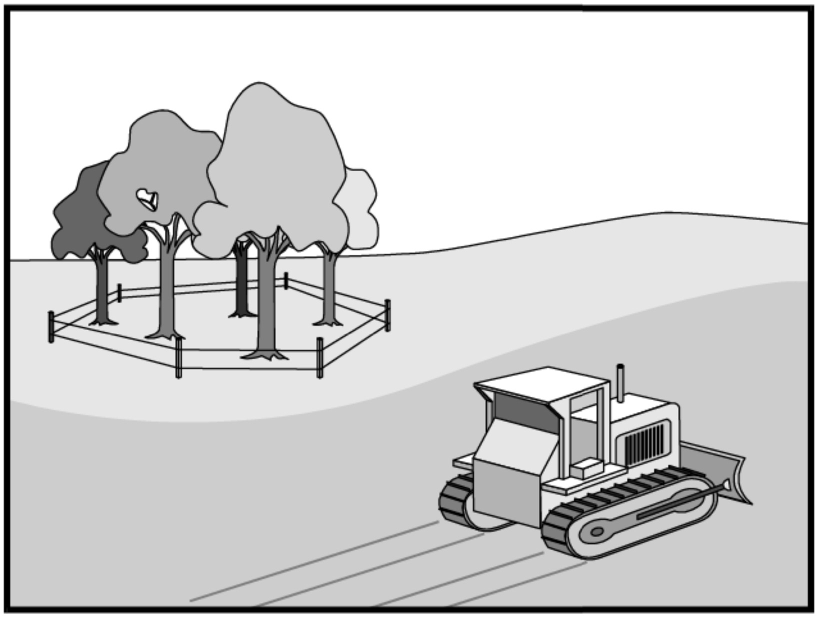
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

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

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

Preservation Of Existing Vegetation EC-2



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.

- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.

- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.

- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

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Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

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

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

Timing

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

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

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

Inspection and Maintenance

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

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

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

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

References

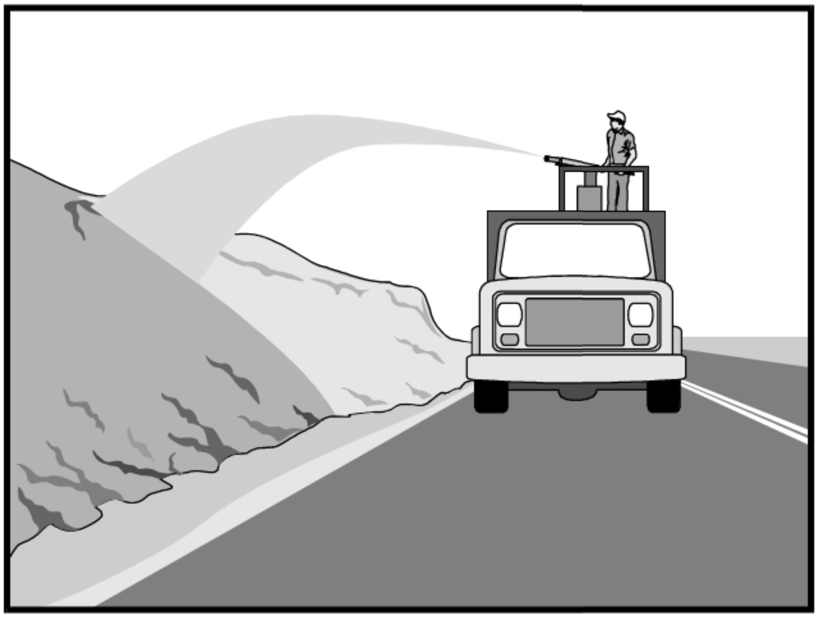
County of Sacramento Tree Preservation Ordinance, September 1981.

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

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

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

Hydraulic Mulch



Description and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

Suitable Applications

Hydraulic mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

Wood fiber hydraulic mulches are generally short lived and need 24 hours to dry before rainfall occurs to be effective. May require a second application in order to remain effective for an entire rainy season.

Implementation

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.

- To be effective, hydraulic matrices require 24 hours to dry before rainfall occurs.

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

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

- Paper based hydraulic mulches alone shall not be used for erosion control.

Hydraulic Mulches

Wood fiber mulch can be applied alone or as a component of hydraulic matrices. Wood fiber applied alone is typically applied at the rate of 2,000 to 4,000 lb/acre. Wood fiber mulch is manufactured from wood or wood waste from lumber mills or from urban sources.

Hydraulic Matrices

Hydraulic matrices include a mixture of wood fiber and acrylic polymer or other tackifier as binder. Apply as a liquid slurry using a hydraulic application machine (i.e., hydro seeder) at the following minimum rates, or as specified by the manufacturer to achieve complete coverage of the target area: 2,000 to 4,000 lb/acre wood fiber mulch, and 5 to 10% (by weight) of tackifier (acrylic copolymer, guar, psyllium, etc.)

Bonded Fiber Matrix

Bonded fiber matrix (BFM) is a hydraulically applied system of fibers and adhesives that upon drying forms an erosion resistant blanket that promotes vegetation, and prevents soil erosion. BFMs are typically applied at rates from 3,000 lb/acre to 4,000 lb/acre based on the manufacturer's recommendation. A biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM should also be biodegradable and should not dissolve or disperse upon re-wetting. Typically, biodegradable BFMs should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Costs

Average cost for installation of wood fiber mulch is $900/acre. Average cost for installation of BFM is $5,500/acre.

Inspection and Maintenance

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

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

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

References

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

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

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

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

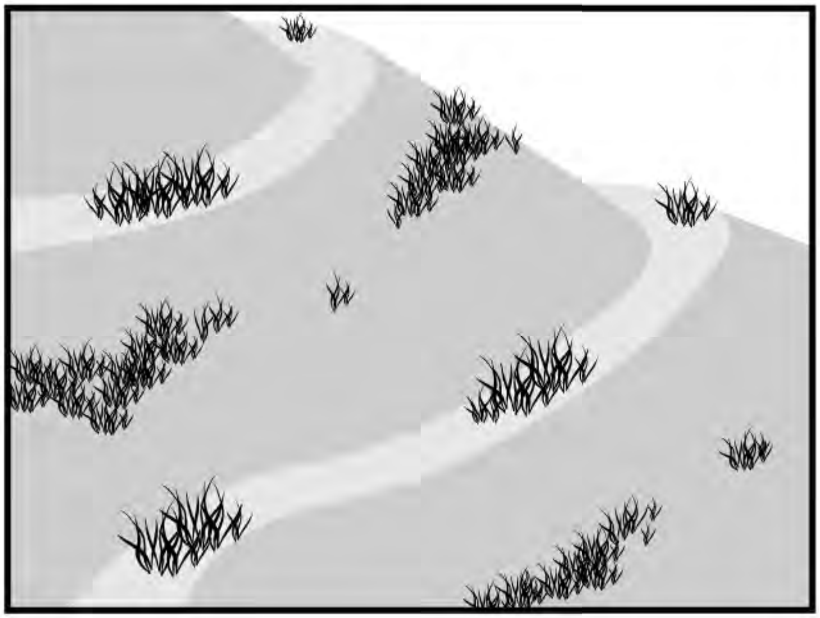
Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

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

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

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

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



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, to temporarily protect exposed soils from erosion by water and wind.

Suitable Applications

Hydroseeding is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short term inactivity.

Implementation

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

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

The following steps shall be followed for implementation:

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Hydroseeding can be accomplished using a multiple step or one step process. The multiple step process ensures maximum direct contact of the seeds to soil. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the area to be seeded with the furrows trending along the contours.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.
- Follow up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average cost for installation and maintenance may vary from as low as $300 per acre for flat slopes and stable soils, to $1600 per acre for moderate to steep slopes and/or erosive soils.

Hydroseeding		Installed Cost per Acre
High Density	Ornamentals	$400 - $1600
	Turf Species	$350
	Bunch Grasses	$300 - $1300
Fast Growing	Annual	$350 - $650
	Perennial	$300 - $800
Non-Competing	Native	$300 - $1600
	Non-Native	$400 - $500
Sterile	Cereal Grain	$500

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

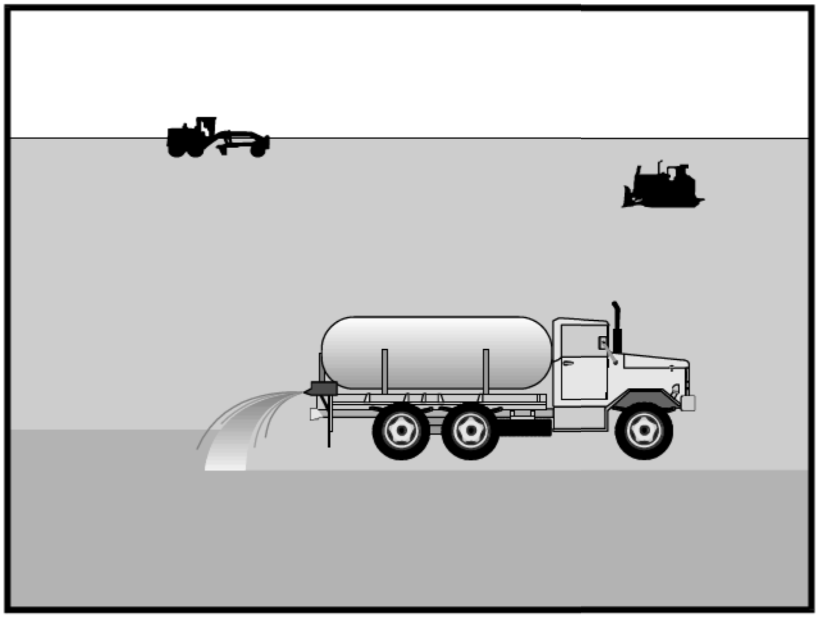
Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems shall be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

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

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



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Soil binders consist of applying and maintaining a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water induced erosion of exposed soils on construction sites. Soil binders also prevent wind erosion.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring short term temporary protection. Because soil binders can often be incorporated into the work, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are also suitable for use on stockpiles.

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

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- Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.
- A sampling and analysis plan must be incorporated into the SWPPP as soil binders could be a source of non-visible pollutants.

Implementation

General Considerations

- Regional soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater.
- Some soil binders may not be compatible with existing vegetation.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Selecting a Soil Binder

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

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

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

lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material Based (Short Lived) Binders

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

Application Rates for Guar Soil Stabilizer

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

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

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

Plant-Material Based (Long Lived) Binders

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

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

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

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound should air cure within a maximum of 36 to 48 hours. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

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

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

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

Poly-Acrylamide and Copolymer of Acrylamide: Linear copolymer polyacrylamide is packaged as a dry flowable solid. When used as a stand alone stabilizer, it is diluted at a rate of 11lb/1,000 gal of water and applied at the rate of 5.0 lb/acre.

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

Cementitious-Based Binders

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

Applying Soil Binders

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

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

Costs

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

Soil Binder	Cost per Acre
Plant-Material Based (Short Lived) Binders	$400
Plant-Material Based (Long Lived) Binders	$1,200
Polymeric Emulsion Blend Binders	$400 (1)
Cementitious-Based Binders	$800

(1) $1,200 for Acrylic polymers and copolymers

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

References

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

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

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

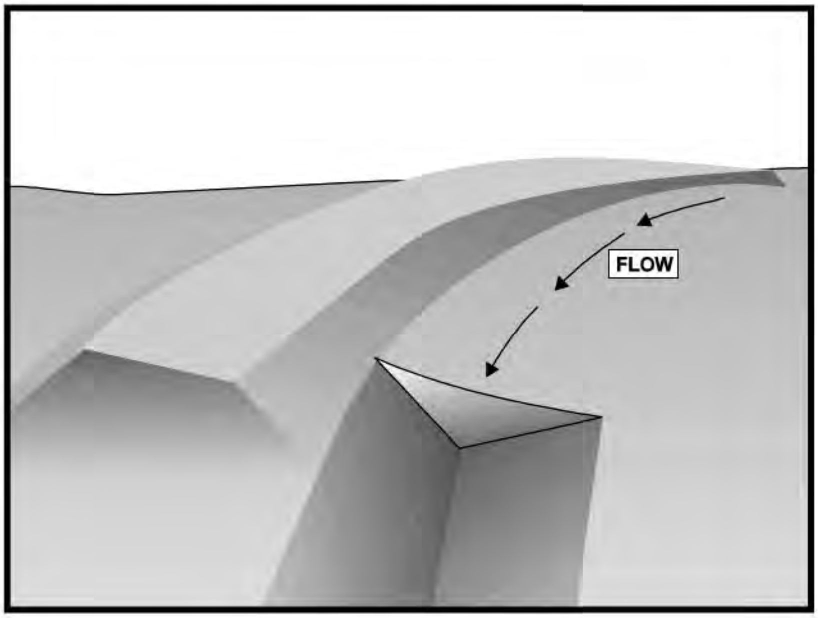
Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

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

Table 1 Properties of Soil Binders for Erosion Control

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

(1) See Implementation for specific rates.



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

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

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

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

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

Implementation

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

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

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

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

General

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

Earth Dikes

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

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.

- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

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

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.

- Filter cloth may be used to cover dikes in use for long periods.

- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

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

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

- No more than 5 acres may drain to a temporary drainage swale.

- Place drainage swales above or below, not on, a cut or fill slope.

- Swale bottom width should be at least 2 ft

- Depth of the swale should be at least 18 in.

- Side slopes should be 2:1 or flatter.

- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.

- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.

- Compact any fill material along the path of the swale.

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

Costs

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

Inspection and Maintenance

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

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

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

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

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

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

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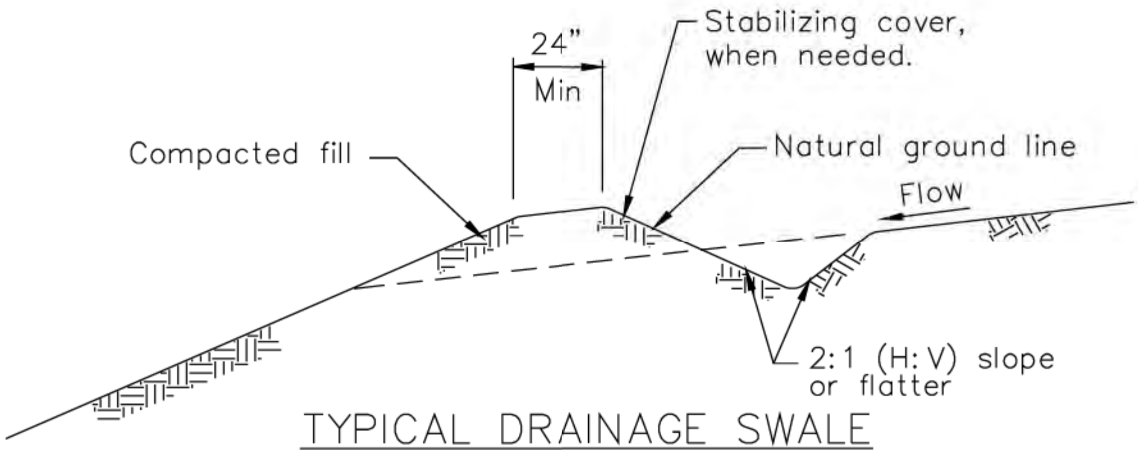
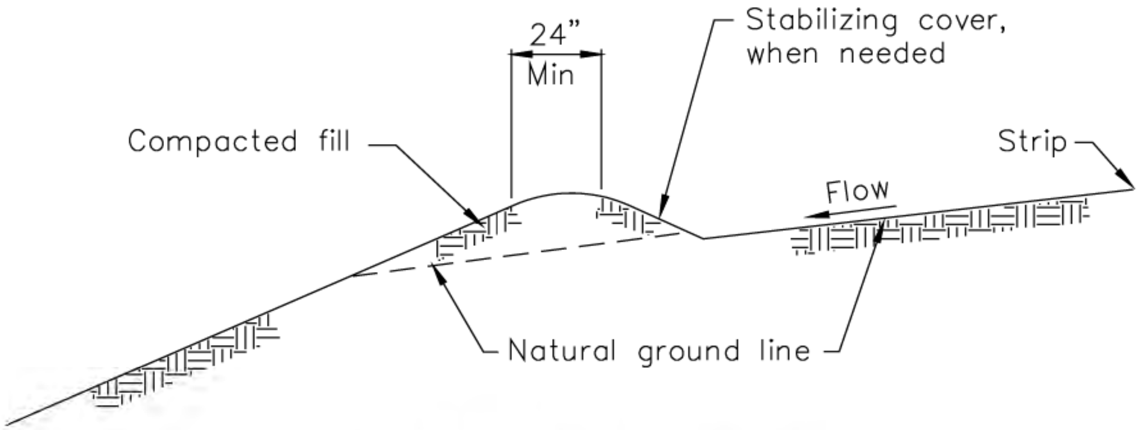


TYPICAL DRAINAGE SWALE

NOT TO SCALE

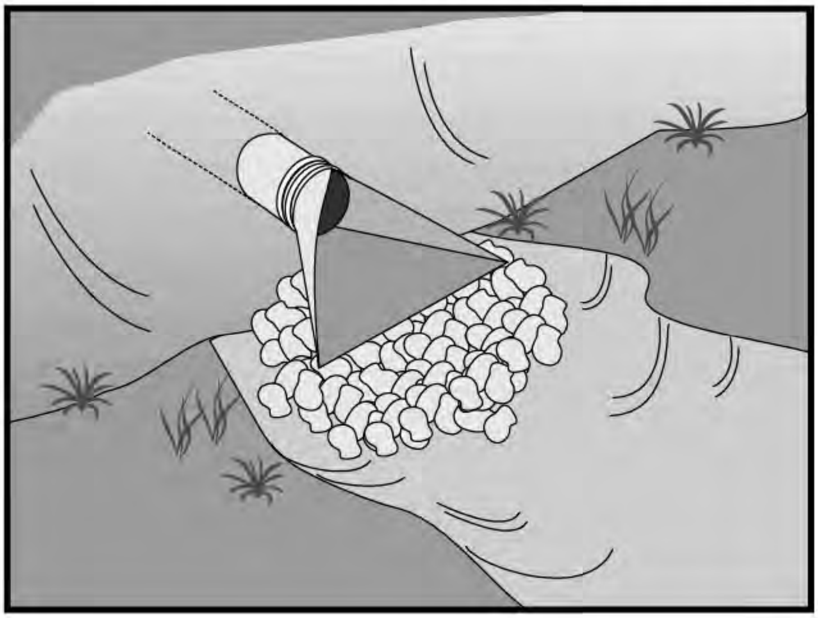
NOTES:

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



TYPICAL EARTH DIKE

NOT TO SCALE



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

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

Suitable Applications

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

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

Limitations

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

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

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

Design and Layout

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

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
    - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
    - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

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

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

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

Costs

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

Inspection and Maintenance

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

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

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

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

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

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

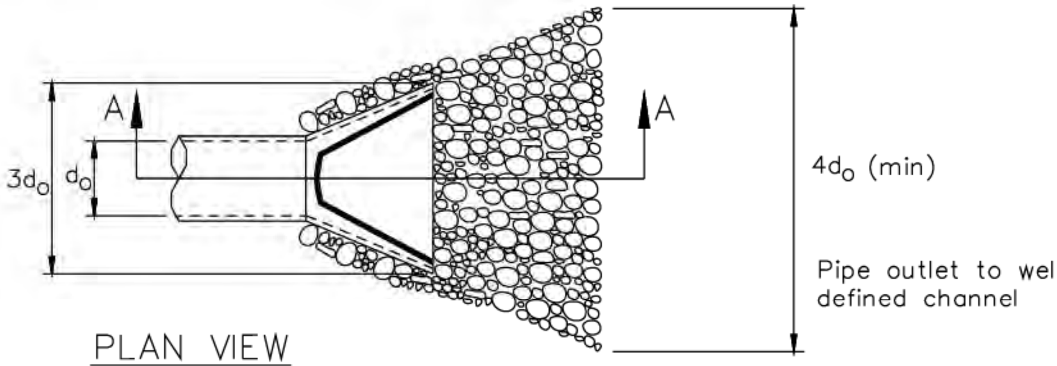
Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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

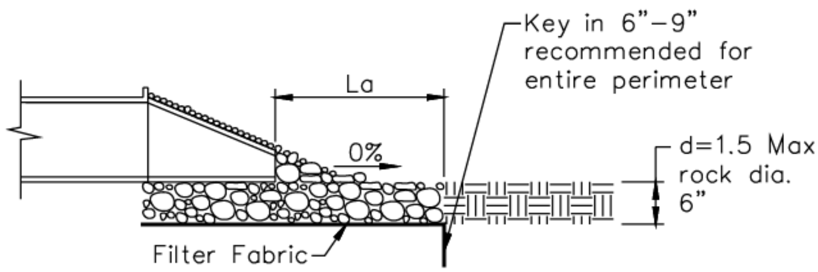
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

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

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



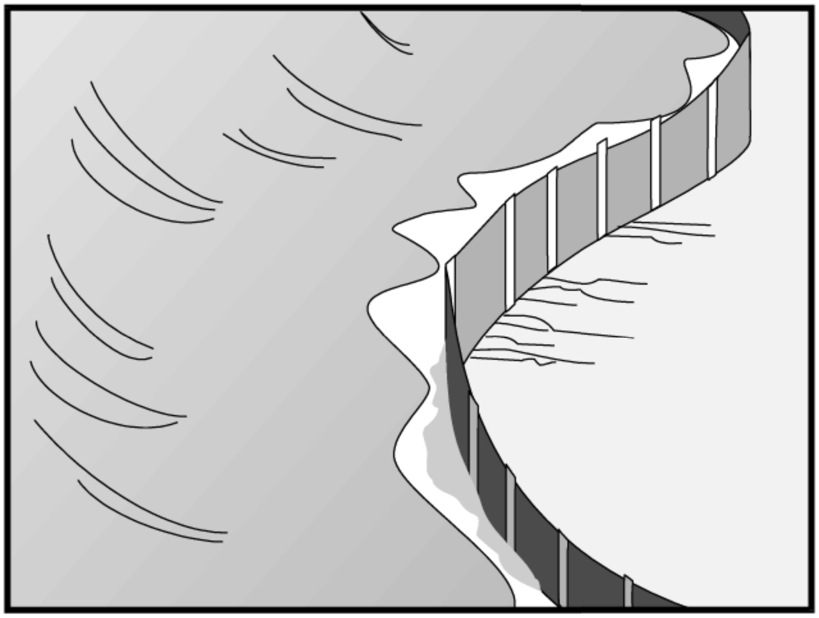
PLAN VIEW



SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

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



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

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

Suitable Applications

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

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

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

Implementation

General

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

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don’t use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.

- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.

- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.

2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

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

- Layout in accordance with attached figures.

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

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

Materials

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

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

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

- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

Installation Guidelines

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

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.

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

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

- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with compacted native material.

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

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

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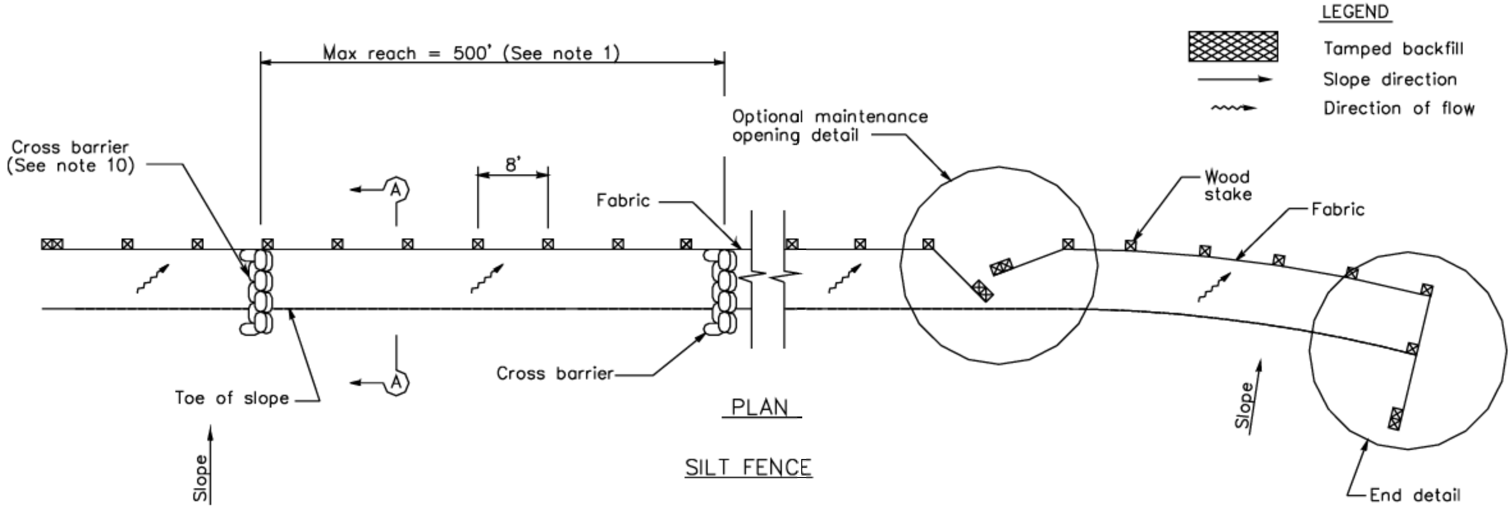
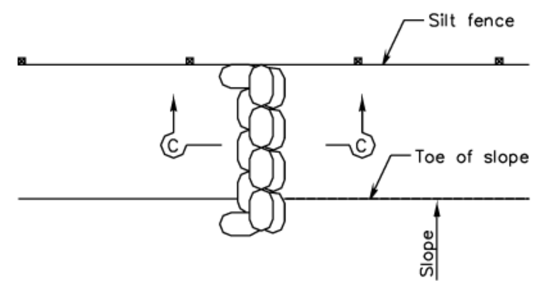


PLAN

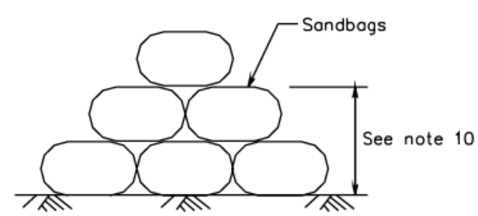
SILT FENCE

NOTES

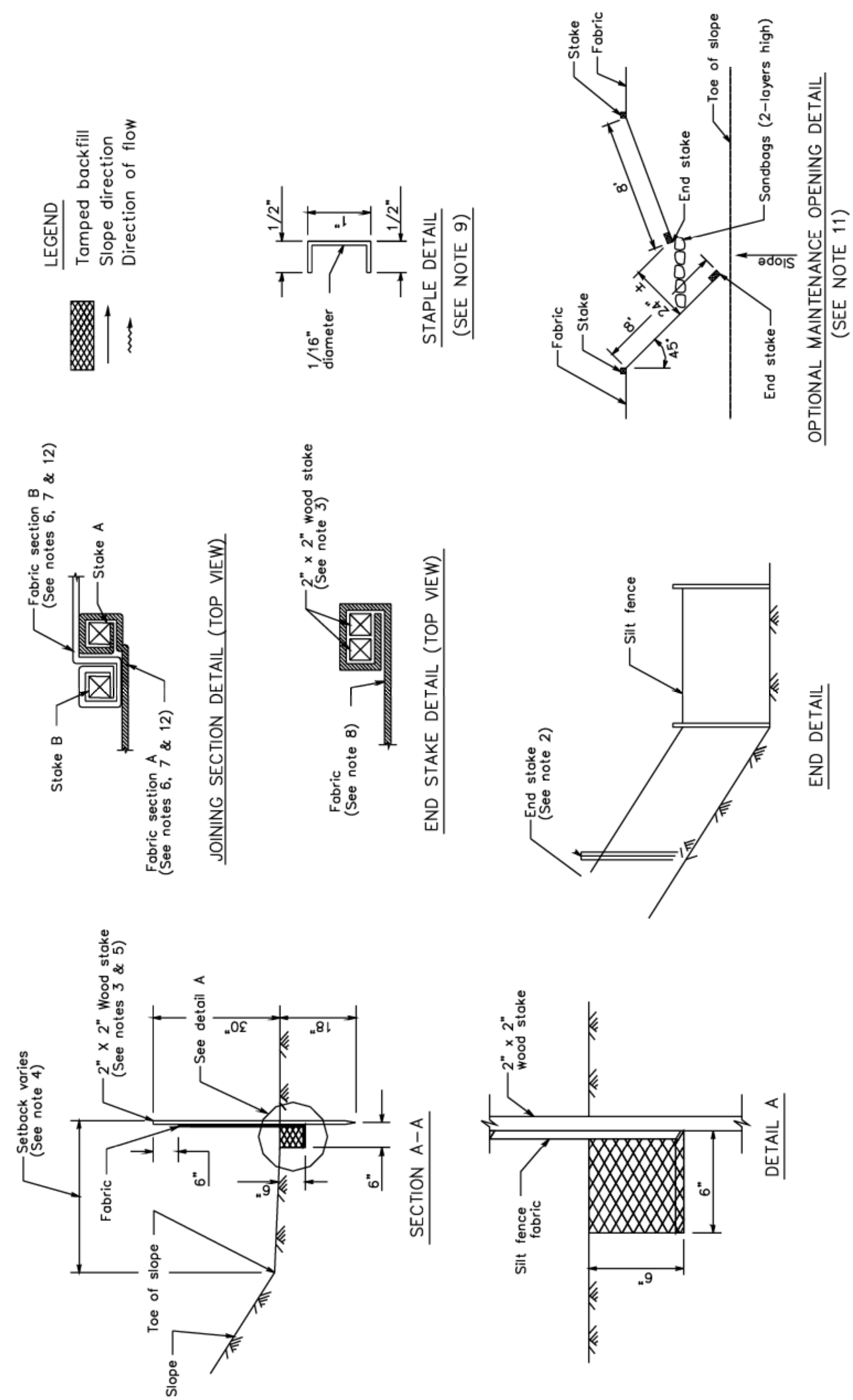
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to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

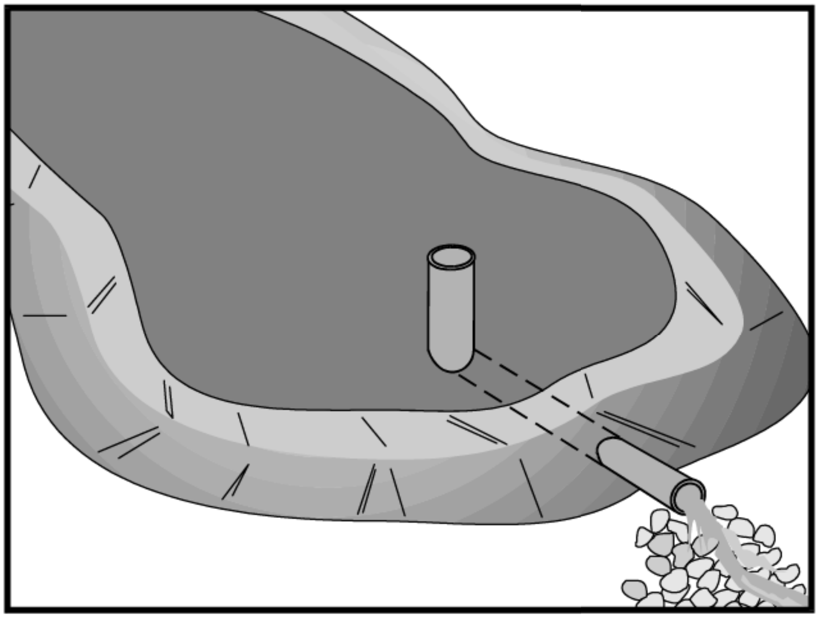


CROSS BARRIER DETAIL



SECTION C-C


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



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

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

Suitable Applications

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

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

Limitations

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

- Generally, sediment basins are limited to drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical treatment is used in addition to the sediment basin.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitoes or other pests to breed.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure with a design life of 12 to 28 months in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 % of the sediment that flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas. Drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin must not be located in a stream but it should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

- Construct before clearing and grading work begins when feasible.
- Do not locate in a stream.
- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Large basins are subject to state and local dam safety requirements.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

Sediment basins must be designed in accordance with Section A of the State of California NPDES General Permit for Stormwater Discharges Associated with Construction Activities (General Permit) where sediment basins are the only control measure proposed for the site. If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate design standards specified herein may be used.

Sediment basins designed per the General Permit shall be designed as follows:

Option 1:

Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

OR

Option 2:

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet (133 yd^3) of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency.

OR

Option 3:
Sediment basin(s) shall be designed using the standard equation:

$$As=1.2Q/Vs \qquad \text{(Eq. 1)}$$

Where:

As = Minimum surface area for trapping soil particles of a certain size

Vs = Settling velocity of the design particle size chosen

Q = C I A

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient

I = Precipitation intensity for the 10-year, 6-hour rain event

A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 2 ft of capacity.

OR

Option 4:
The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Other design considerations are:

- The volume of the settling zone should be sized to capture runoff from a 2-year storm or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 % of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- Sediment basins are best used in conjunction with erosion controls. Sediment basins that will be used as the only means of treatment, without upstream erosion and sediment controls, must be designed according to the four options required by the General Permit (see Options 1-4 above). Sediment basins that are used in conjunction with upstream erosion and sediment controls should be designed to have a capacity equivalent to 67 yd^3 of sediment storage per acre of contributory area.
- The length of the basin should be more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet.
- The depth must be no less than 3 ft.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- Basins should be designed to drain within 72 hours following storm events. If a basin fails to drain within 72 hours, it must be pumped dry.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- Basin inlets should be located to maximize travel distance to the basin outlet.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen; although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 72 hours (also referred to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 72-hour limit is specified to mitigate vector control concerns.
- The two most common outlet problems that occur are: (1) the capacity of the outlet is too great resulting in only partial filling of the basin and drawdown time less than designed for; and (2) the outlet clogs because it is not adequately protected against trash and debris. To avoid these problems, the following outlet types are recommended for use: (1) a single orifice outlet with or without the protection of a riser pipe, and (2) perforated riser. Design guidance for single orifice and perforated riser outlets follow:
  - *Flow Control Using a Single Orifice At The Bottom Of The Basin (Figure 1)*: The outlet control orifice should be sized using the following equation:

$$a = \frac{2A(H-Ho)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7x10^{-5})A(H-Ho)^{0.5}}{CT} \qquad \text{(Eq. 2)}$$

where:

a = area of orifice (ft^2)

A = surface area of the basin at mid elevation (ft^2)

C = orifice coefficient

T = drawdown time of full basin (hrs)

g = gravity (32.2 ft/s²)

H = elevation when the basin is full (ft)

Ho = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75x10^{-6})A(H - Ho)^{0.5}}{C} \qquad \text{(Eq. 3)}$$

- *Flow Control Using Multiple Orifices (see Figure2):*

$$a_t = \frac{2A(h_{\max})}{3600CT(2g[h_{\max} - h_{centroid\ of\ orifices}])^{0.5}} \qquad \text{(Eq. 4)}$$

With terms as described above except:

a_t = total area of orifices

h_{max} = maximum height from lowest orifice to the maximum water surface (ft)

$h_{centroid\ of\ orifices}$ = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 2).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

C = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

C = 0.80 when the material is thicker than the orifice diameter

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).

- Areas under embankments must be cleared and stripped of vegetation.

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

Average annual costs for installation and maintenance (2 year useful life) are:

- Basin less than 50,000 ft^3: Range, \$0.24 - \$1.58/ft^3. Average, \$0.73 per ft^3. \$400 - \$2,400, \$1,200 average per drainage acre.

- Basin size greater than 50,000 ft^3: Range, \$0.12 – \$0.48/ft^3. Average, \$0.36 per ft^3. \$200 - \$800, \$600 average per drainage acre.

Inspection and Maintenance

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

- Examine basin banks for seepage and structural soundness.

- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.

- Check inlet and outlet area for erosion and stabilize if required.

- Check fencing for damage and repair as needed.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at appropriate locations.

- Remove standing water from basin within 72 hours after accumulation.

- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

- To minimize vector production:

  - Remove accumulation of live and dead floating vegetation in basins during every inspection.

  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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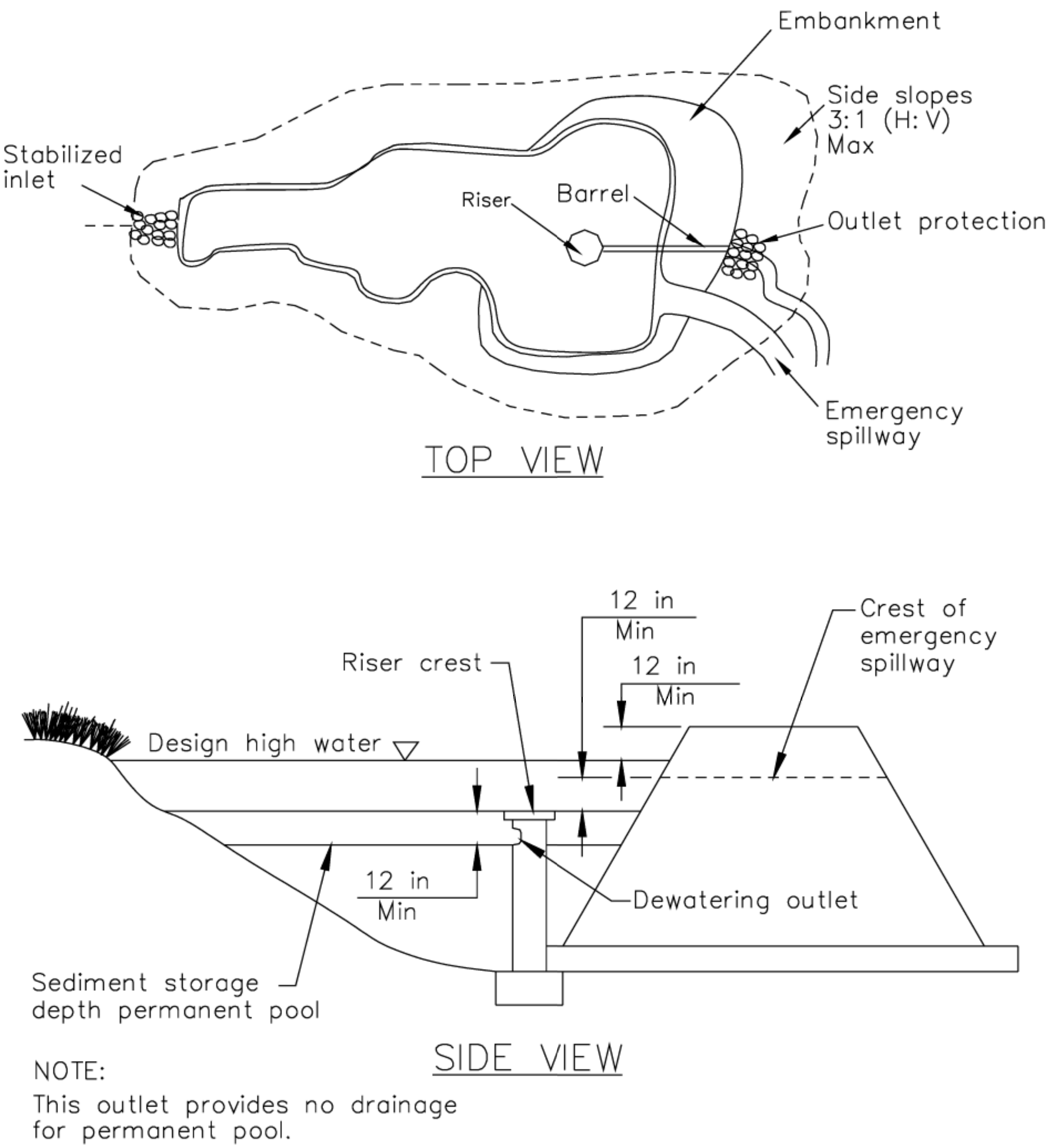


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN

SINGLE ORIFICE DESIGN

NOT TO SCALE

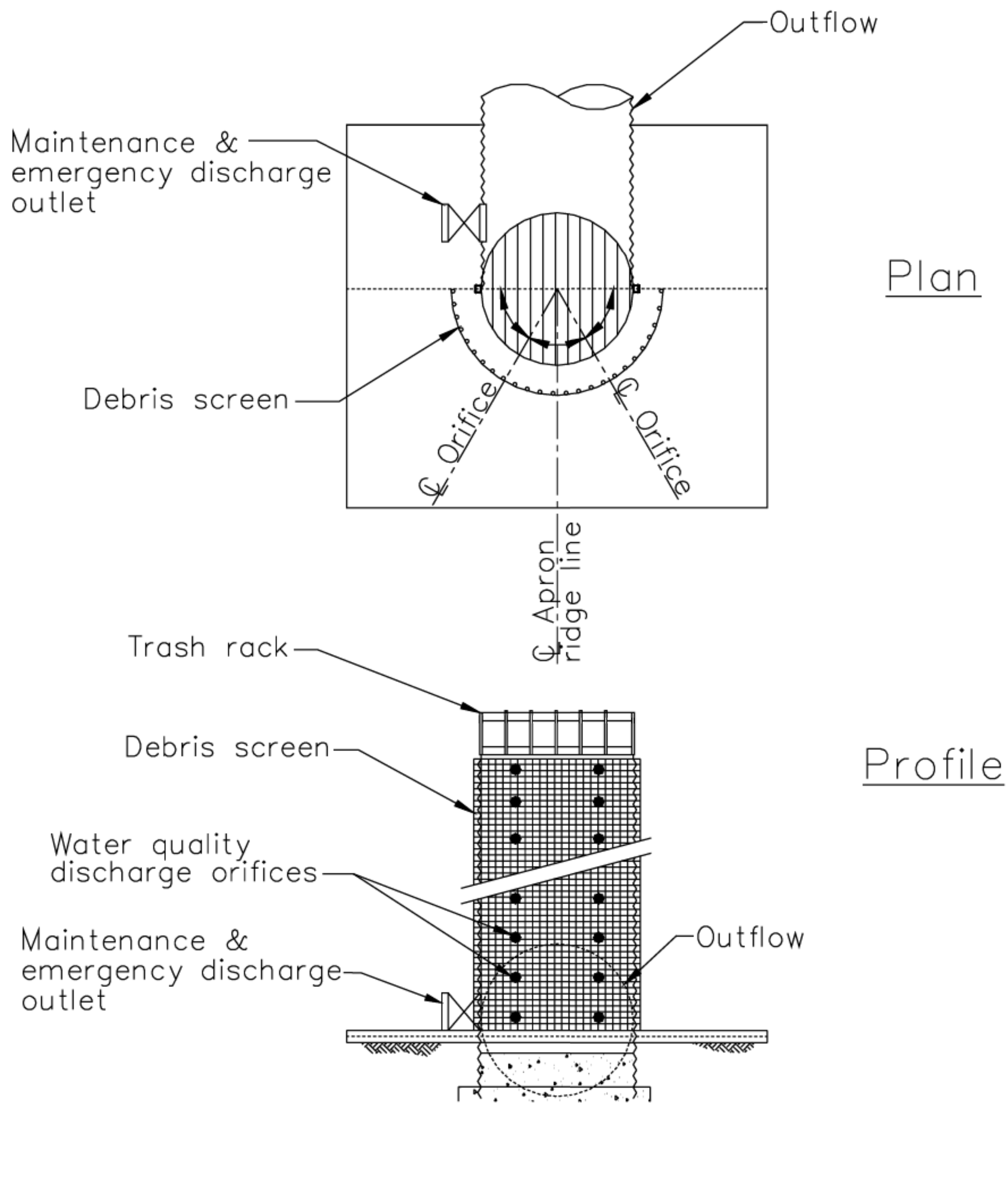


FIGURE 3: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

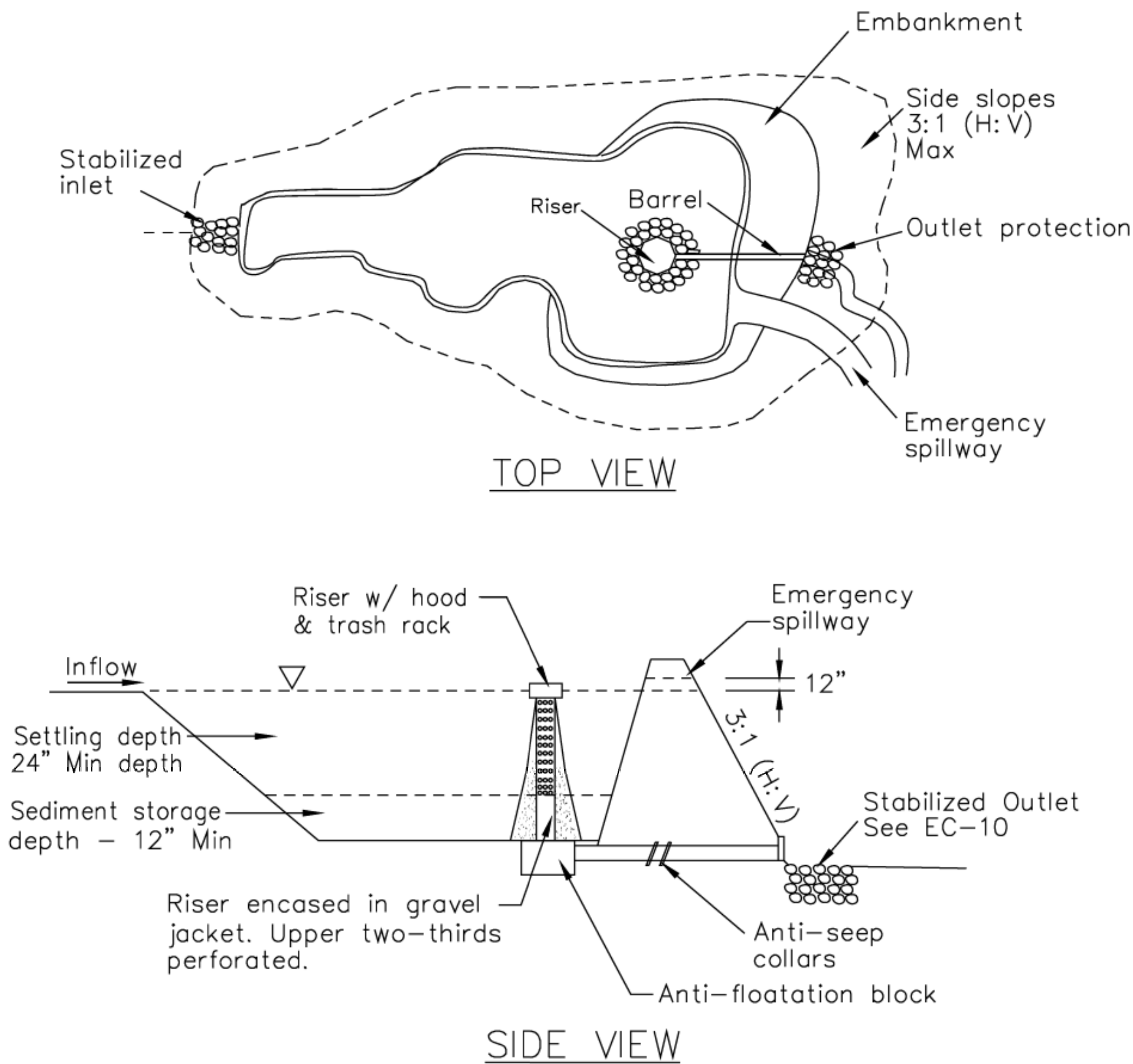
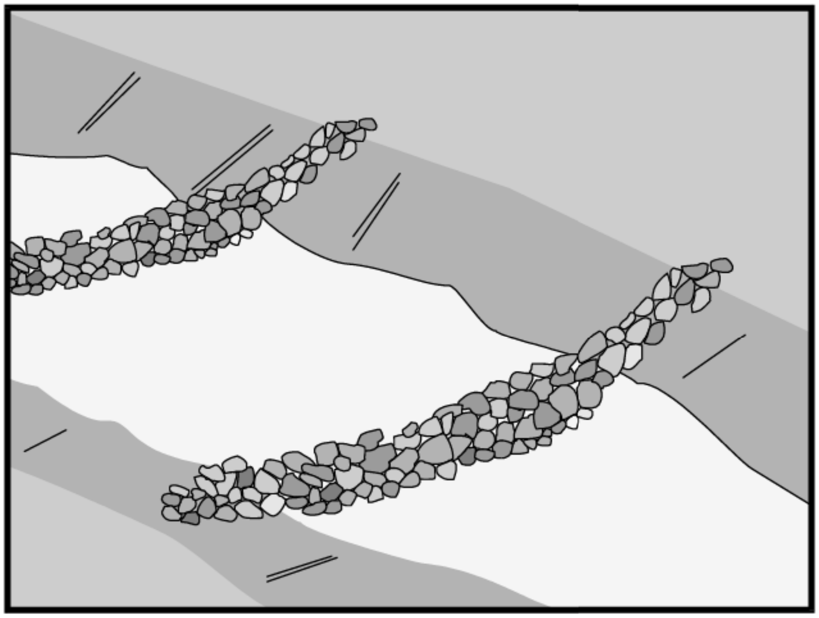


FIGURE 2: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

Limitations

- Not to be used in live streams or in channels with extended base flows.

- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Reduced slopes reduce the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Use of check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity must be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, there are several options:

- Don't use check dams. Consider alternative BMPs.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam. The center section of the dam should be lower than the edge sections so that the check dam will direct flows to the center of the ditch or swale.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products manufactured specifically for use as check dams are also being used, and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Straw bales can also be used for check dams and can work if correctly installed; but in practice, straw bale check dams have a high failure rate. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam must completely span the ditch or swale to prevent washout. The rock used must be large enough to stay in place given the expected design flow through the channel.

Log check dams are usually constructed of 4 to 6 in. diameter logs. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

Gravel bag and sandbag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet.

Manufactured products should be installed in accordance with the manufacturer's instructions.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- Backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap must be cleaned following each storm event.
- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.
- Gravel bags may be used as check dams with the following specifications:

Materials
Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms. Sandbags used for check dams should conform to SE-8, Sandbag Barrier. Fiber rolls used for check dams should conform to SE-5, Fiber Rolls. Straw bales used for check dams should conform to SE-9, Straw Bale Barrier.

Installation
- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section. Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Fiber rolls and straw bales must be trenched in and firmly staked in place.

Costs

Cost consists of only installation costs if materials are readily available. If material must be imported, costs may increase. For material costs, see SE-5, SE-6, SE-8 and SE-9.

Inspection and Maintenance

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

- Replace missing rock, bags, bales, etc. Replace bags or bales that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.

- Remove accumulated sediment prior to permanent seeding or soil stabilization.

- Remove check dam and accumulated sediment when check dams are no longer needed.

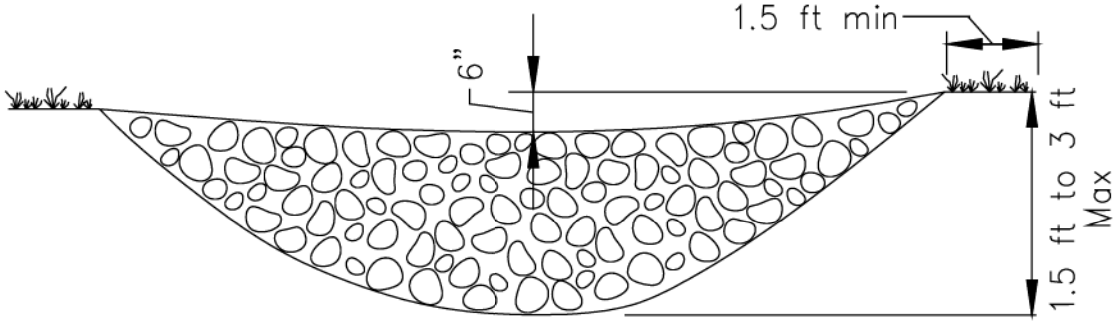
References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

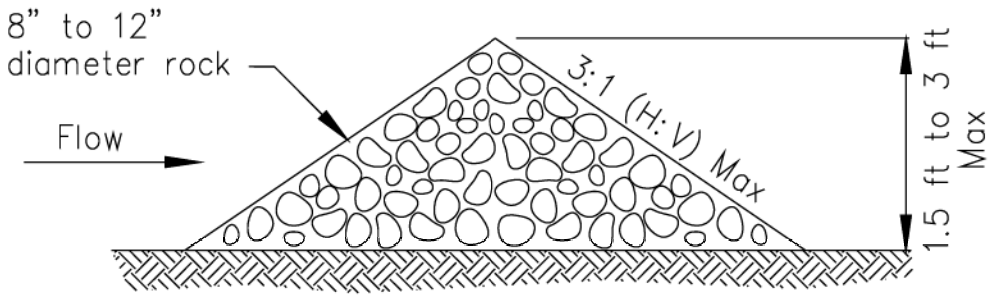
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

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

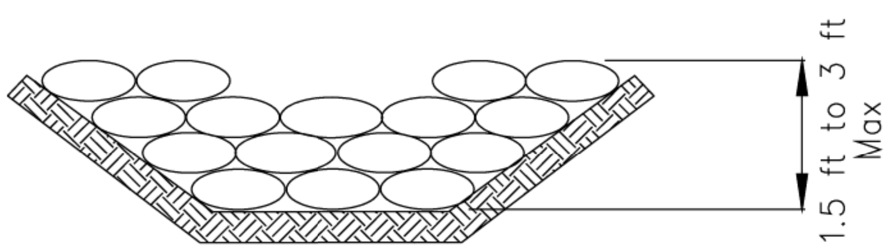


ELEVATION



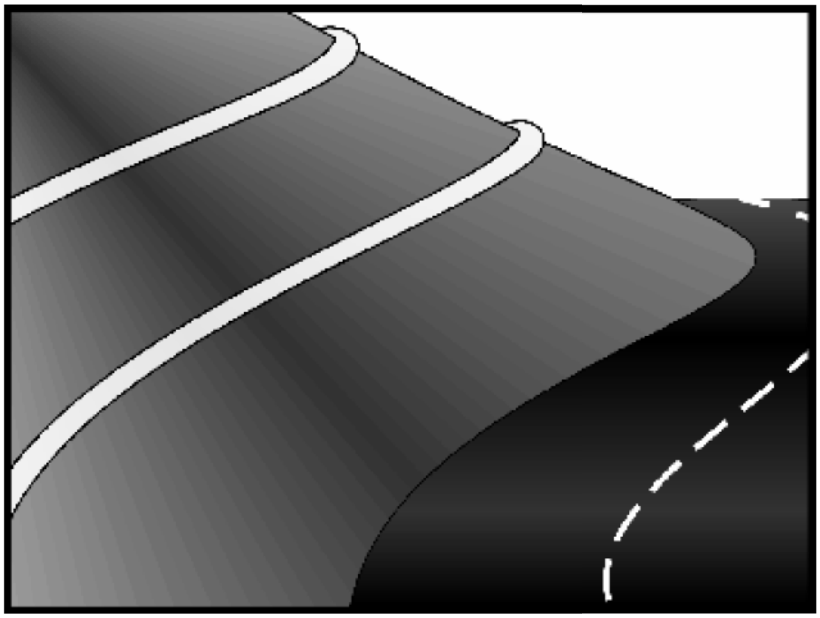
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE

Fiber Rolls SE-5



Description and Purpose

A fiber roll consists of straw, flax, or other similar materials bound into a tight tubular roll. When fiber rolls are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- As check dams in unlined ditches
- Down-slope of exposed soil areas
- Around temporary stockpiles

Limitations

- Fiber rolls are not effective unless trenched

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

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- Fiber rolls at the toe of slopes greater than 5:1 (H:V) should be a minimum of 20 in. diameter or installations achieving the same protection (i.e. stacked smaller diameter fiber rolls, etc.).

- Difficult to move once saturated.

- If not properly staked and trenched in, fiber rolls could be transported by high flows.

- Fiber rolls have a very limited sediment capture zone.

- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.

Implementation

Fiber Roll Materials

- Fiber rolls should be either prefabricated rolls or rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 8 in. diameter.

- Bind roll at each end and every 4 ft along length of roll with jute-type twine.

Installation

- Locate fiber rolls on level contours spaced as follows:

  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.

- Stake fiber rolls into a 2 to 4 in. deep trench with a width equal to the diameter of the fiber roll.

  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

Removal

- Fiber rolls are typically left in place.

- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Costs

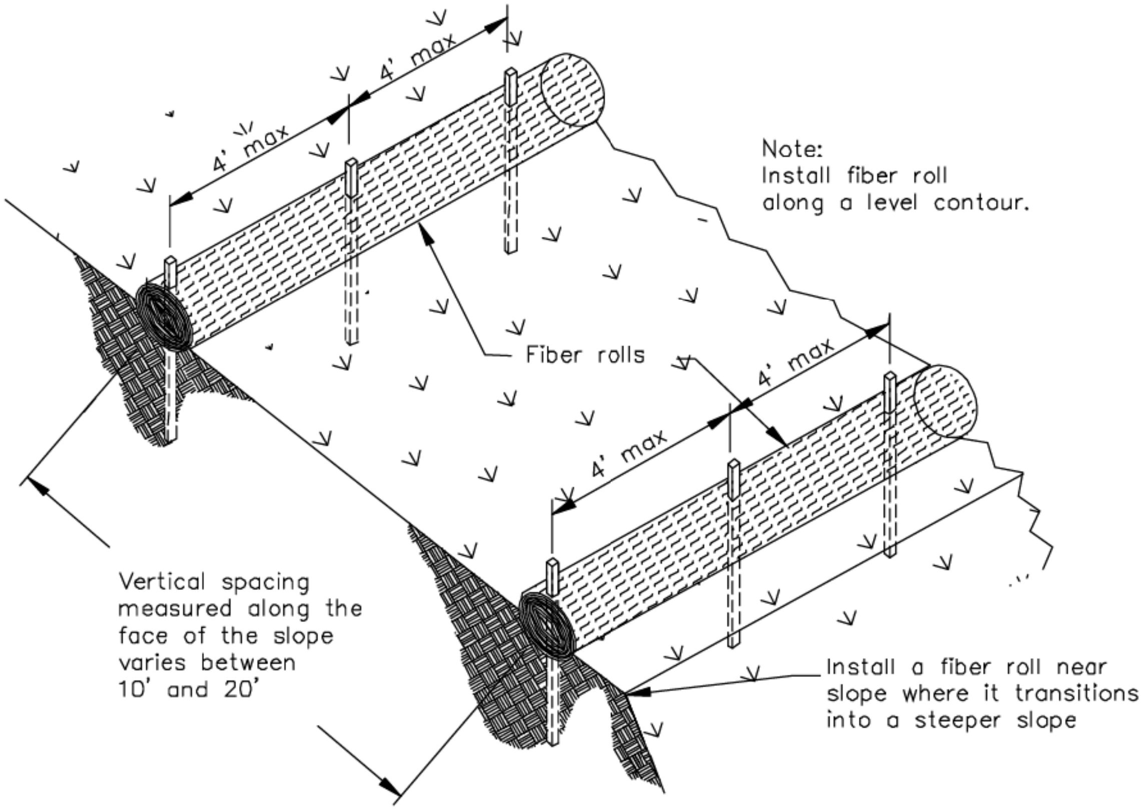
Material costs for fiber rolls range from $20 - $30 per 25 ft roll.

Inspection and Maintenance

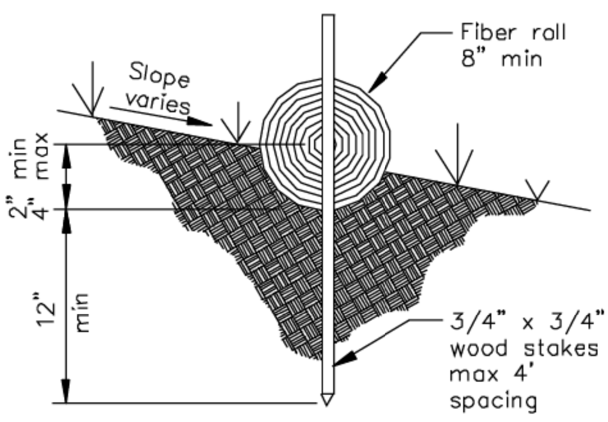
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage depth, usually one-half the distance between the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site of disposed at an appropriate location.
- If fiber rolls are used for erosion control, such as in a mini check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

References

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



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

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

Costs

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

Inspection and Maintenance

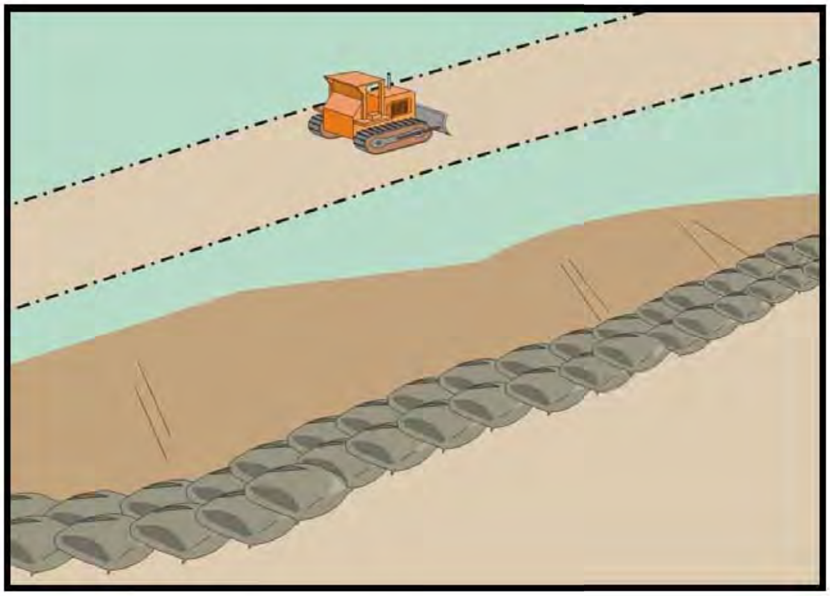
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

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

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-9 Straw Bale Barrier

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept sheet flows. Sandbag barriers pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Barriers may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. While the sand-filled bags are porous, the fine sand tends to quickly plug with sediment, limiting the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms, or SE-9, Straw Bale Barriers. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to ground bag berms, but less porous.

Design and Layout

- Locate sandbag barriers on a level contour.
  - Slopes between 20:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Sandbags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed near the slope toe.
- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sandbags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 5 acres.

- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlapp butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 or flatter.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap may not acceptable in some jurisdictions.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material.

Costs

Sandbag barriers are more costly, but typically have a longer useful life than other barriers. Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag.

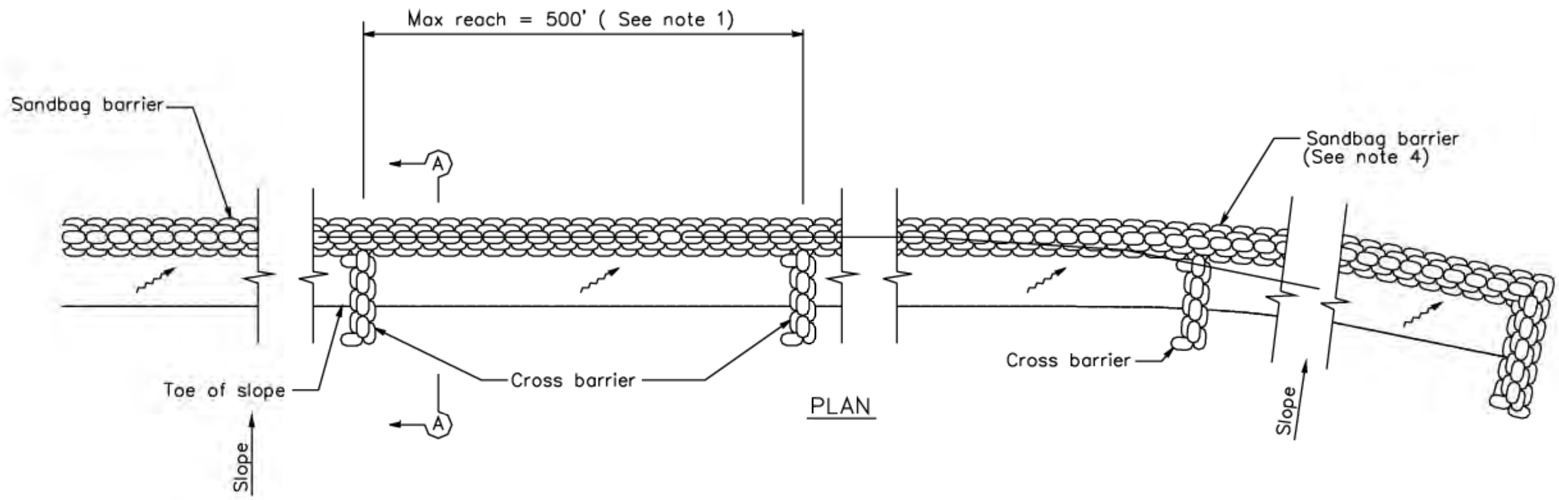
Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.

- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

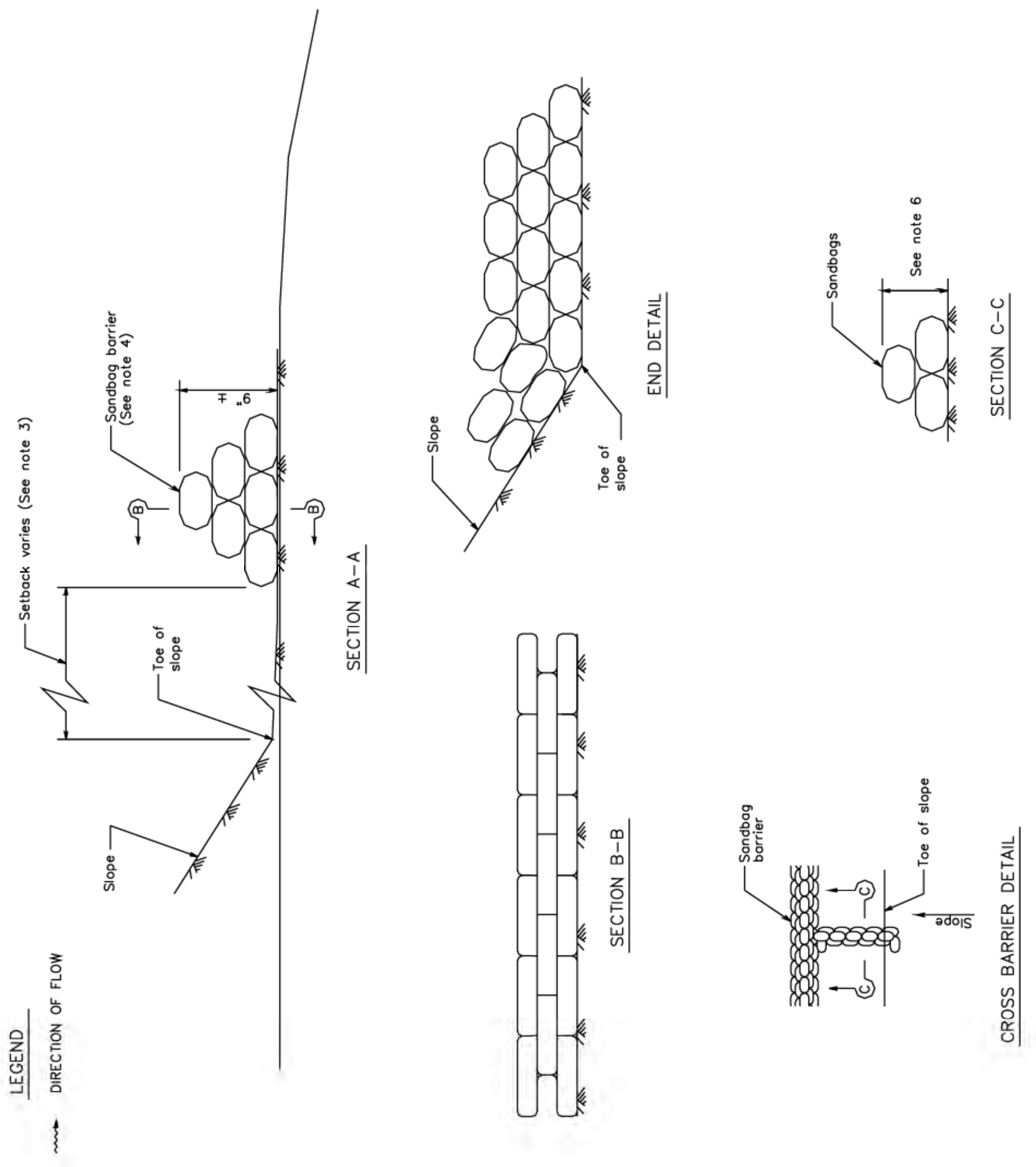
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



SANDBAG BARRIER

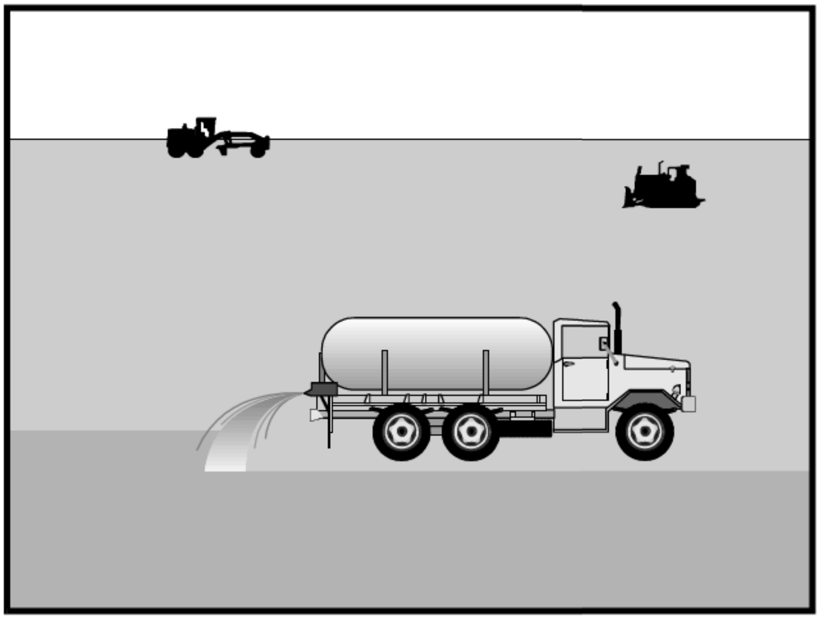
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.



LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Sandbag barrier (See note 4)
9" ±
B
B
Toe of slope
Slope
SECTION A–A
Slope
Toe of slope
END DETAIL
SECTION B–B
Sandbags
See note 6
SECTION C–C
Sandbag barrier
Toe of slope
C
C
Slope
CROSS BARRIER DETAIL

Wind Erosion Control



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

SITE CONDITION	DUST CONTROL PRACTICES								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X		X		X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/ Excavation			X	X		X			X
Truck Traffic on Unpaved Roads			X	X	X		X	X	
Mud/Dirt Carry Out					X		X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.

- Provide covers for haul trucks transporting materials that contribute to dust.

- Provide for wet suppression or chemical stabilization of exposed soils.

- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.

- Stabilize inactive construction sites using vegetation or chemical stabilization methods.

- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

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

- Check areas protected to ensure coverage.

- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

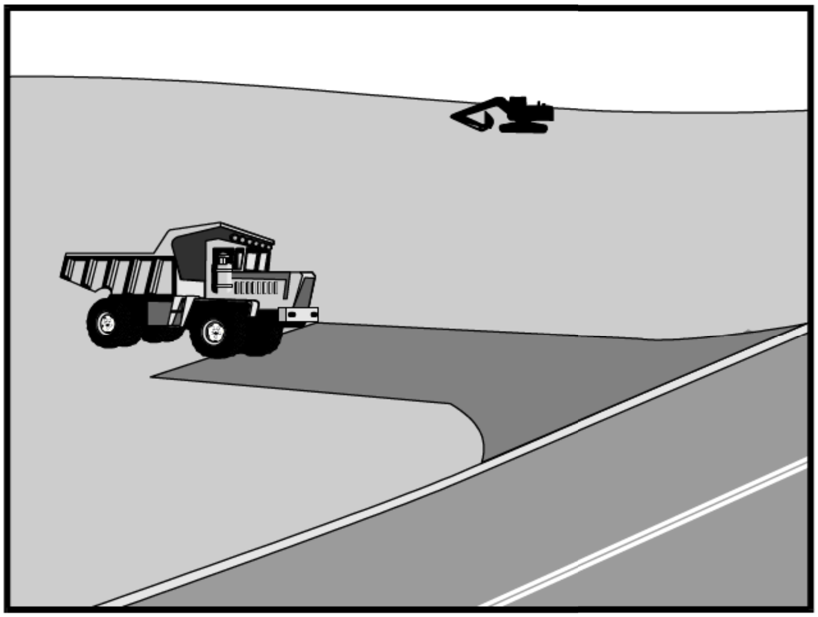
California Air Pollution Control Laws, California Air Resources Board, 1992.

Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

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

Stabilized Construction Entrance/Exit TC-1



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.

- Select 3 to 6 in. diameter stones.

- Use minimum depth of stones of 12 in. or as recommended by soils engineer.

- Construct length of 50 ft minimum, and 30 ft minimum width.

- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.

- Provide ample turning radii as part of the entrance.

- Limit the points of entrance/exit to the construction site.

- Limit speed of vehicles to control dust.

- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.

- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.

- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

- Designate combination or single purpose entrances and exits to the construction site.

- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.

- Implement SE-7, Street Sweeping and Vacuuming, as needed.

- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

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

- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.

- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.

- Keep all temporary roadway ditches clear.

- Check for damage and repair as needed.

- Replace gravel material when surface voids are visible.

- Remove all sediment deposited on paved roadways within 24 hours.

- Remove gravel and filter fabric at completion of construction

Costs

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

References

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

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

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

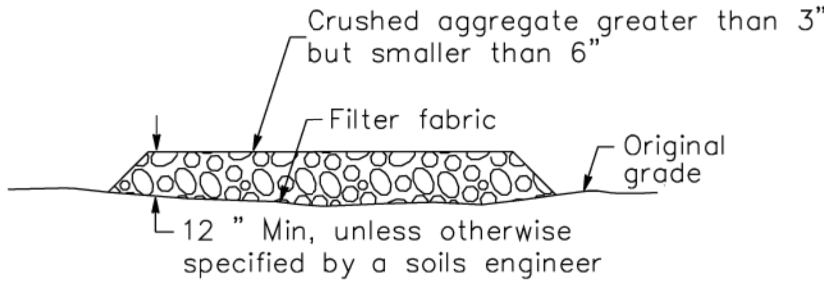
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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

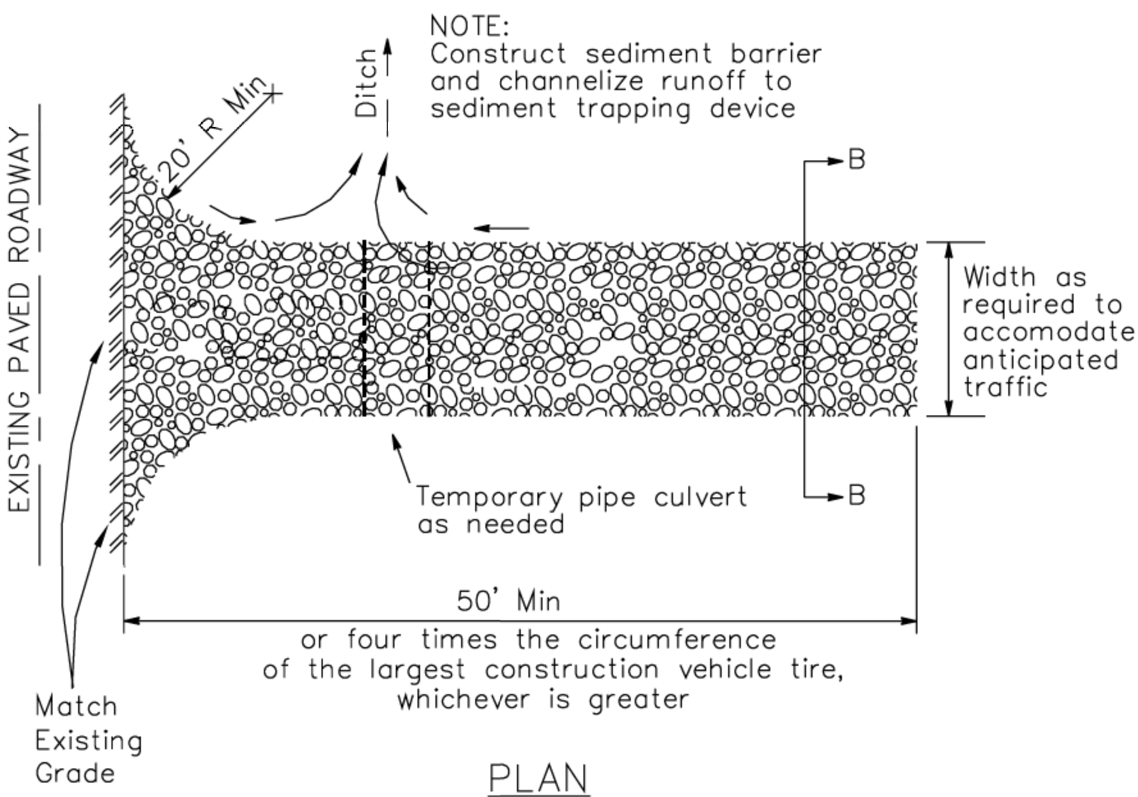
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

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

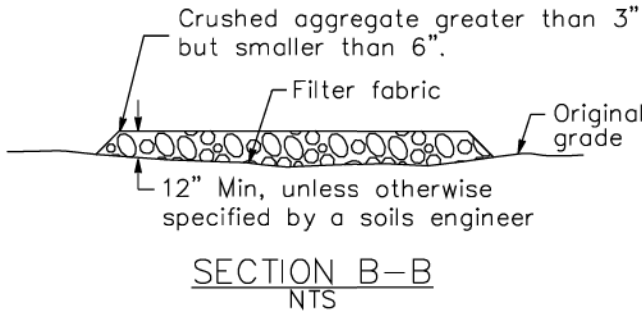
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

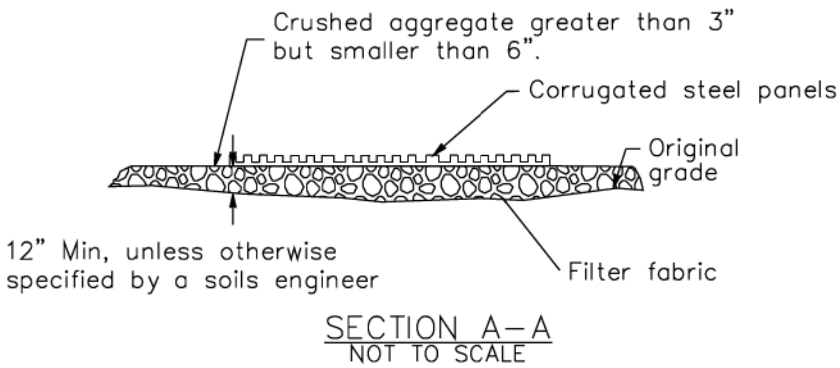


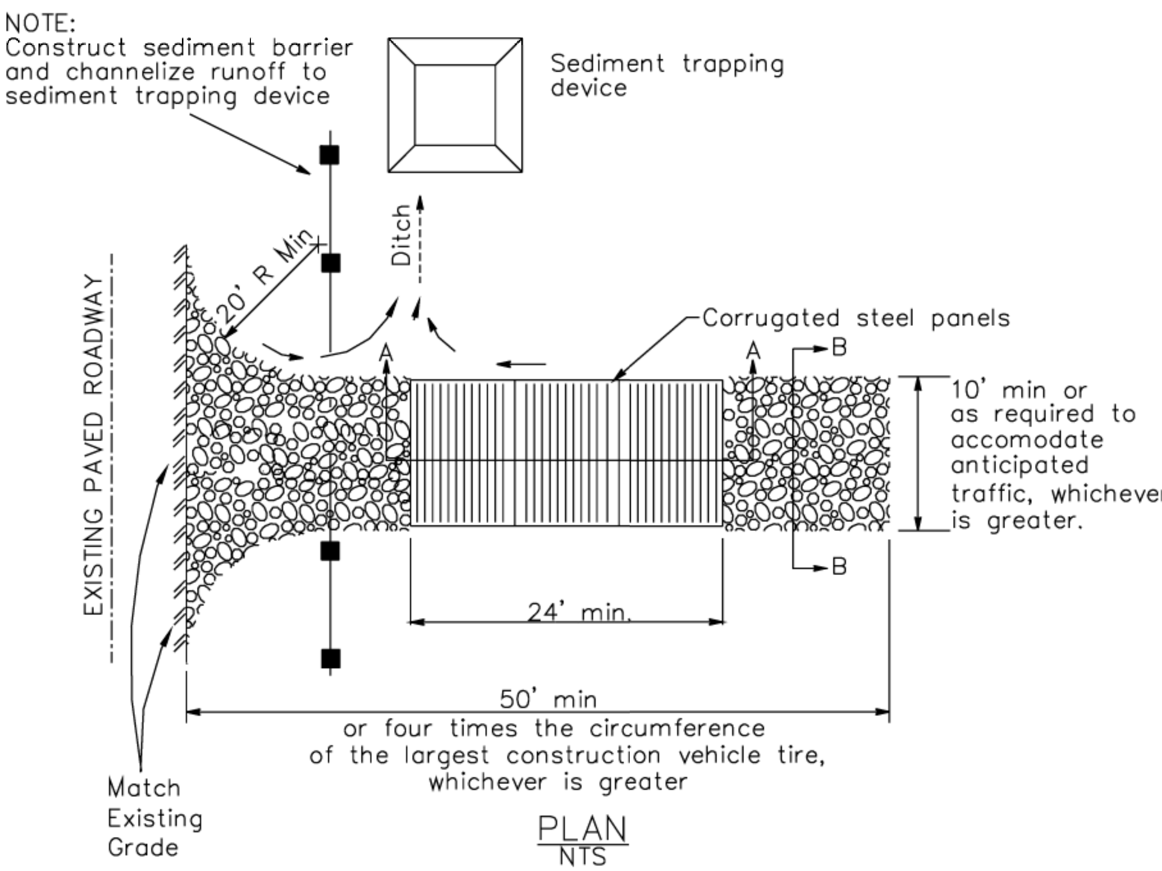
SECTION B–B
NTS



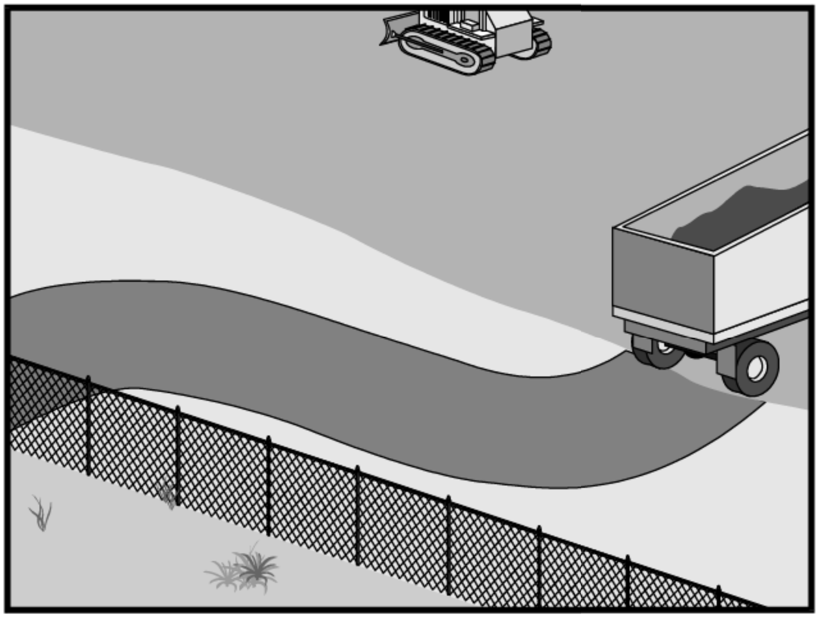
PLAN
NTS


Crushed aggregate greater than 3" but smaller than 6".
Filter fabric
Original grade
12" Min, unless otherwise specified by a soils engineer
SECTION B–B
NTS


Crushed aggregate greater than 3" but smaller than 6".
Corrugated steel panels
Original grade
12" Min, unless otherwise specified by a soils engineer
Filter fabric
SECTION A–A
NOT TO SCALE


NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
Corrugated steel panels
A
A
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater.
24' min.
50' min
or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS

Stabilized Construction Roadway TC-2



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.

- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.

- Coordinate materials with those used for stabilized construction entrance/exit points.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

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

- Keep all temporary roadway ditches clear.

- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

- Periodically apply additional aggregate on gravel roads.

- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

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

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

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

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

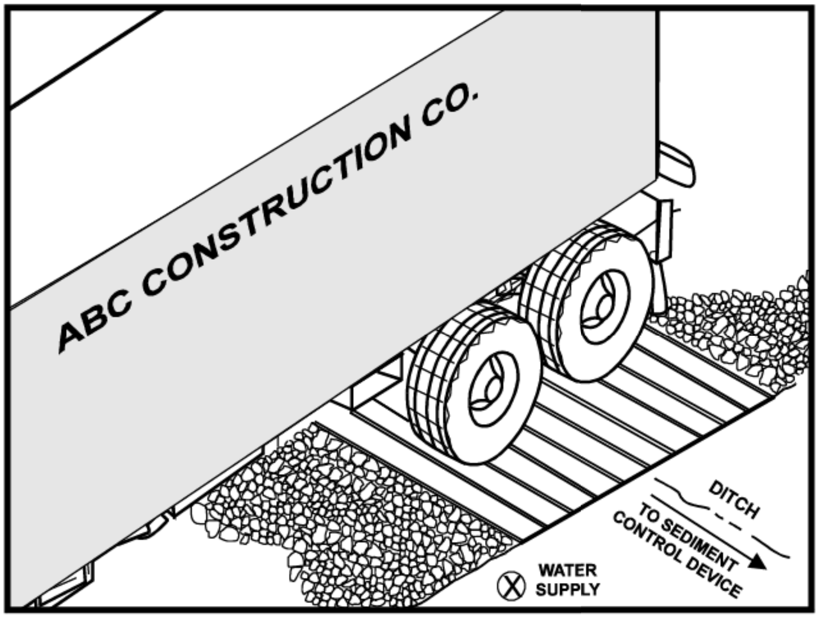
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

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

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

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

Entrance/Outlet Tire Wash TC-3



Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

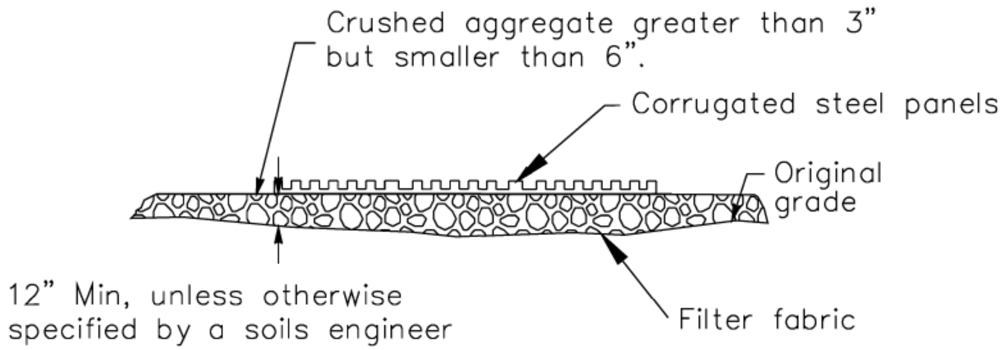
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

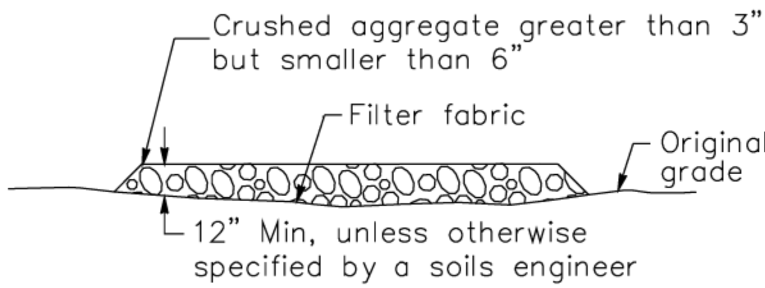
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

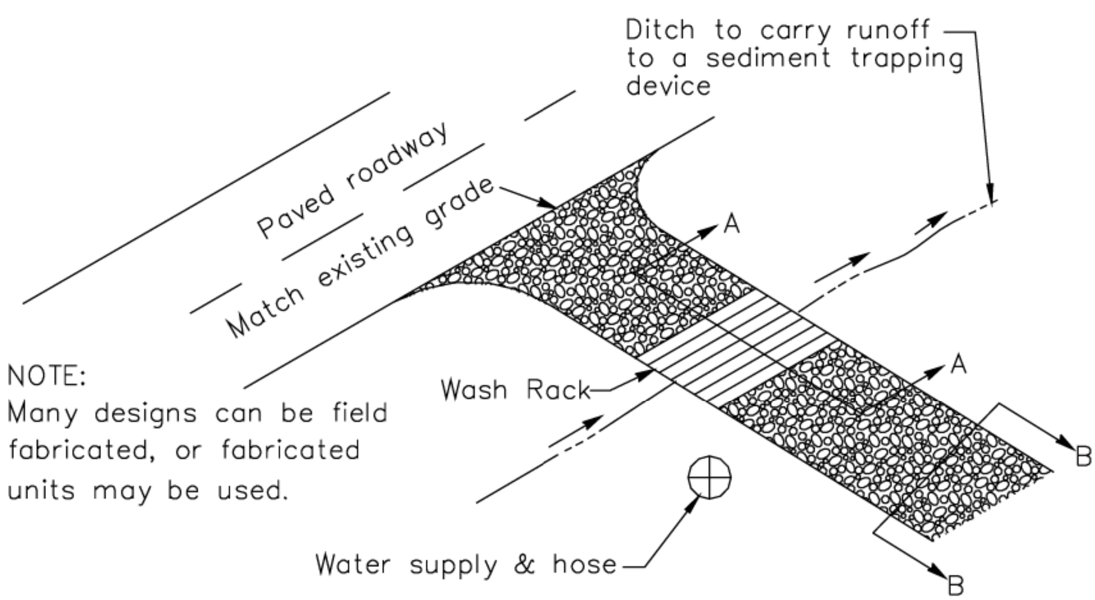
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



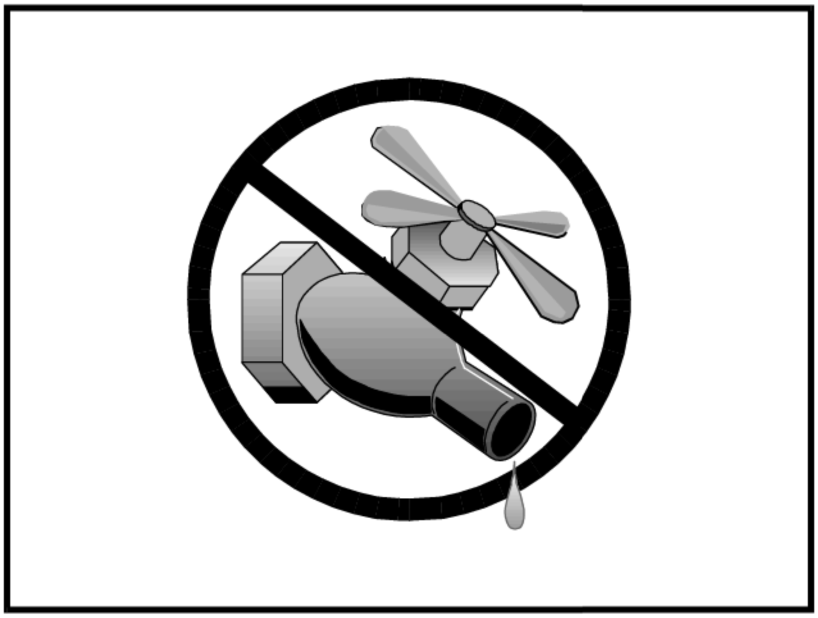
SECTION A–A
NOT TO SCALE



SECTION B–B
NTS



TYPICAL TIRE WASH
NOT TO SCALE



Objectives

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

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

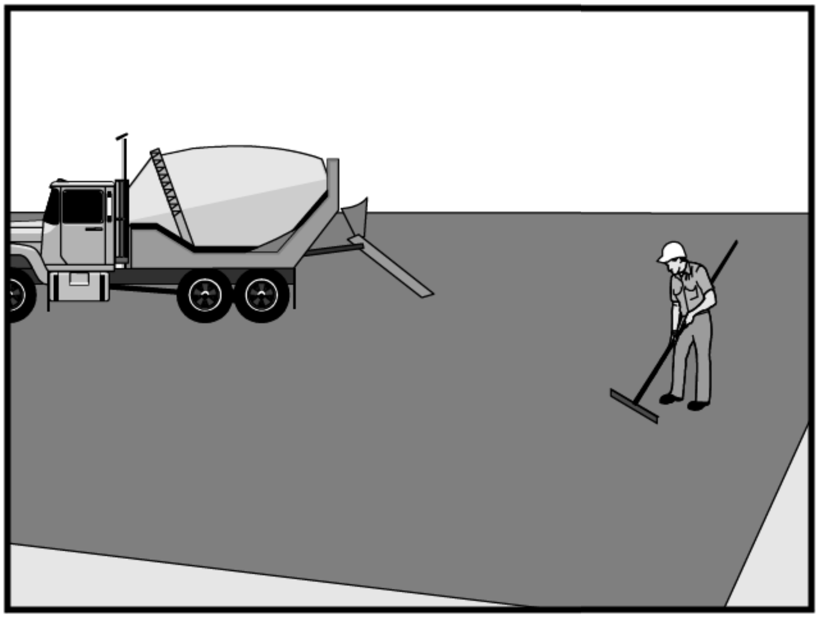
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
    - Water trucks
    - Water reservoirs (water buffalos)
    - Irrigation systems
    - Hydrant connections

References

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

Paving and Grinding Operations NS-3



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is in the forecast.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).

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- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.

- If paving involves an onsite mixing plant, follow the stormwater permitting requirements for industrial activities.

- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses, These materials should be stored consistent with WM-3, Stockpile Management.

- Disposal of PCC and AC waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.

- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:

  - AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drains or watercourses. Install silt fence until structure is stabilized or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; or SE-5, Fiber Rolls.

  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt must be recycled or disposed.

  - Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 1 ft of material.

- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.

- Dig out activities should not be conducted in the rain.

- Collect dig out material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If dig out material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

- Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

- Old asphalt must be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile or dispose of properly.

- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if allowed by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate must not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized.

- Drainage inlet structures and manholes should be covered with filter fabric during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials rather than burying. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks, and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.

- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.

- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.

- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.

- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing when vehicle is deadheaded.

- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.

- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

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

- Keep ample supplies of drip pans or absorbent materials onsite.

- Inspect and maintain machinery regularly to minimize leaks and drips.

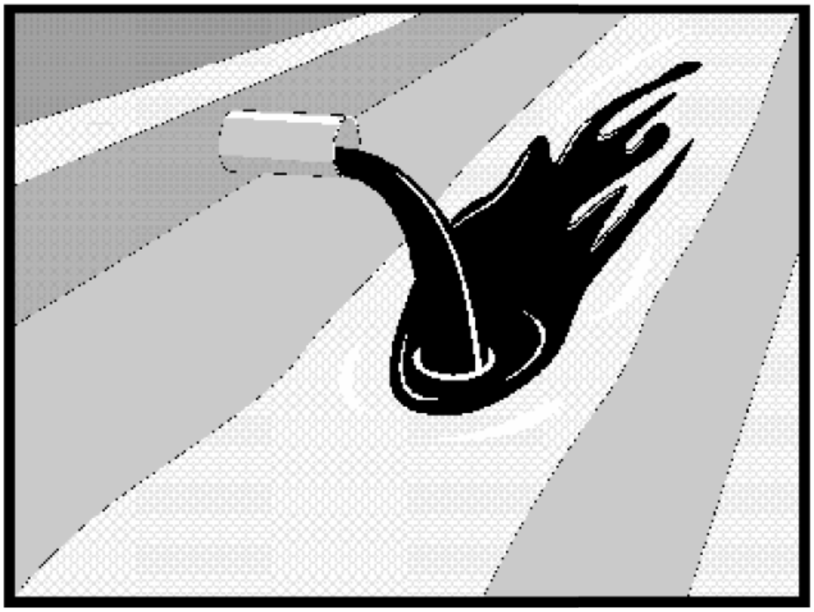
References

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

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

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

Illicit Connection/Discharge NS-6



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.

- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.

- **Solids -** Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

- **Liquids -** signs of illegal liquid dumping or discharge can include:

  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season

- **Urban Areas -** Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects

- **Rural Areas -** Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

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

- Inspect the site regularly to check for any illegal dumping or discharge.

- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.

- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

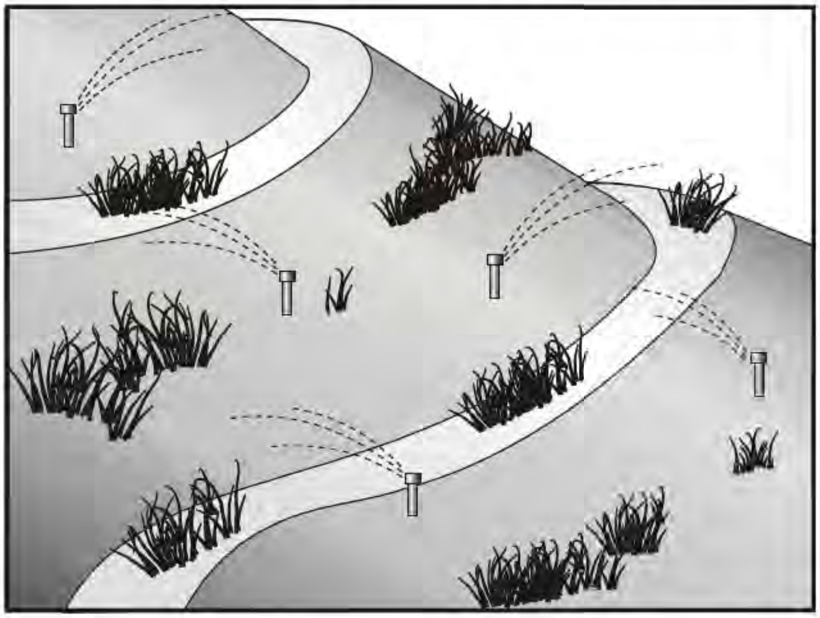
References

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

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

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

Potable Water/Irrigation



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

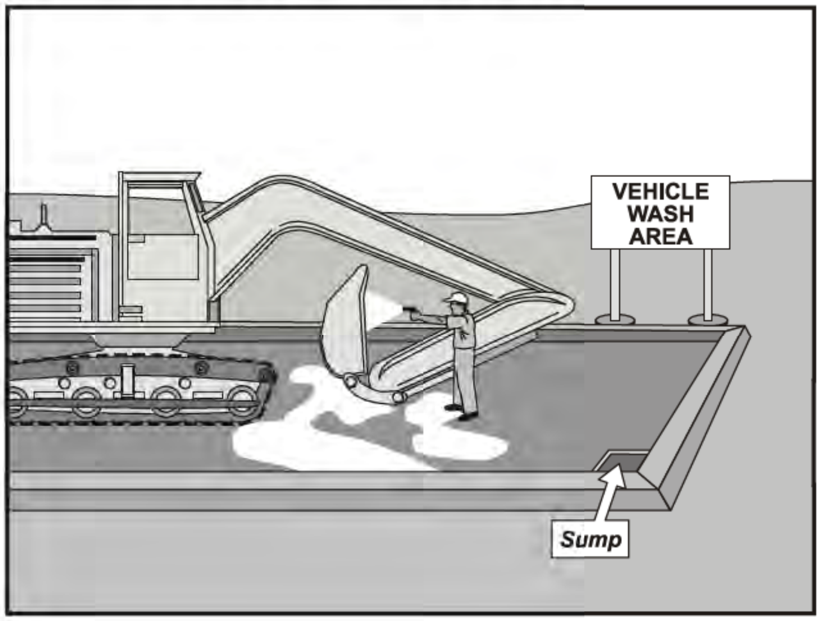
References

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

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

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

Vehicle and Equipment Cleaning NS-8



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

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Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

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

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

- Inspection and maintenance is minimal, although some berm repair may be necessary.

- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

- Inspect sump regularly and remove liquids and sediment as needed.

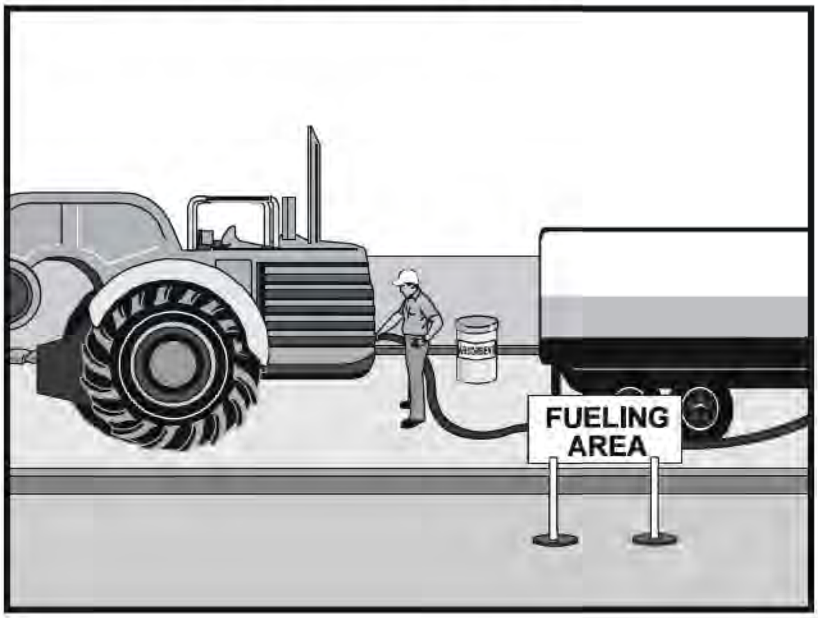
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

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

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.

- Discourage "topping-off" of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

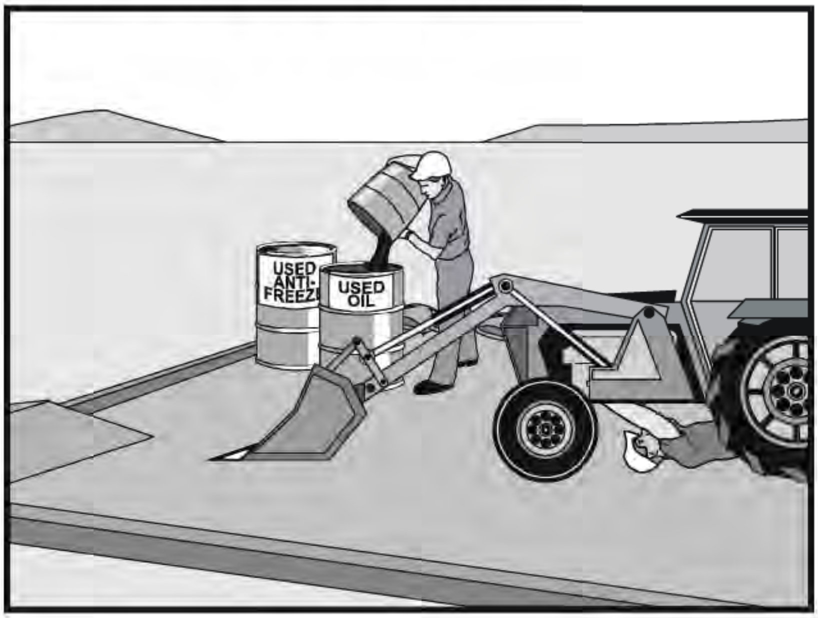
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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

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

Vehicle & Equipment Maintenance NS-10



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.

- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.

- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.

- Place a stockpile of spill cleanup materials where it will be readily accessible.

- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.

- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.

- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.

- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.

- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.

- Train employees and subcontractors in proper maintenance and spill cleanup procedures.

- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.

- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.

- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.

- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.

- Do not place used oil in a dumpster or pour into a storm drain or watercourse.

- Properly dispose of or recycle used batteries.

- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.

- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.

- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

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

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

- Keep ample supplies of spill cleanup materials onsite.

- Maintain waste fluid containers in leak proof condition.

- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

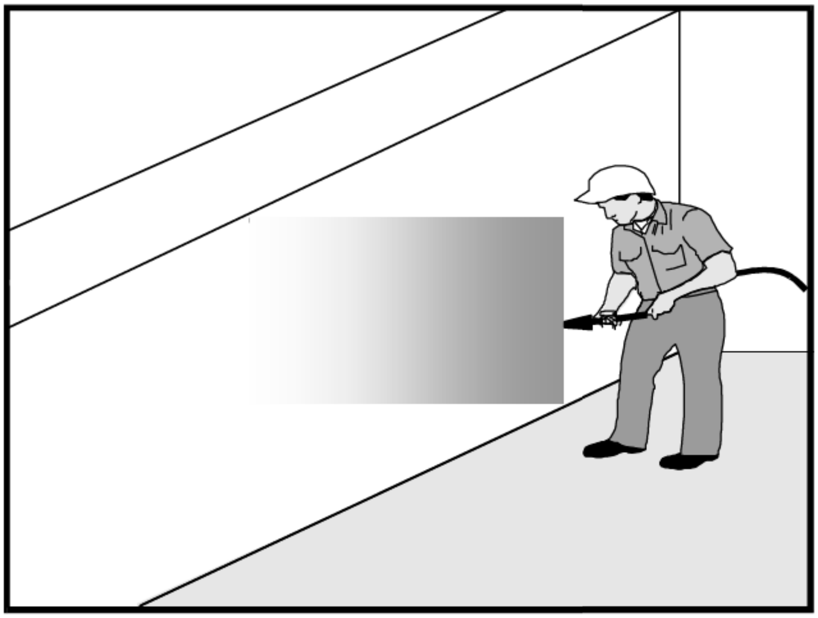
References

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

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

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

Concrete Curing NS-12



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. Proper procedures reduce or eliminate the contamination of stormwater runoff during concrete curing.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

None identified.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.

- Minimize the drift of chemical cure as much as possible by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.

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- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.

- Protect drain inlets prior to the application of curing compounds.

- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for infiltration or other means of removal in accordance with all applicable permits.

- Collect cure water at the top of slopes and transport or dispose of water in a non-erodible manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.

- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

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

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

- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.

- Inspect cure containers and spraying equipment for leaks.

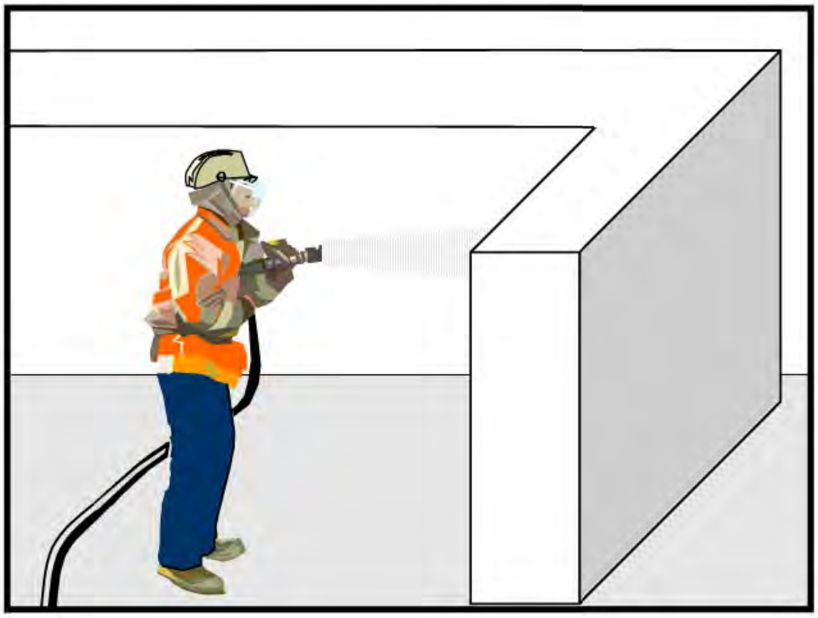
References

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

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

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

Concrete Finishing NS-13



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

None identified.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.

- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.

- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 De-Watering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete based debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Costs

These measures are generally of low cost.

Inspection and Maintenance

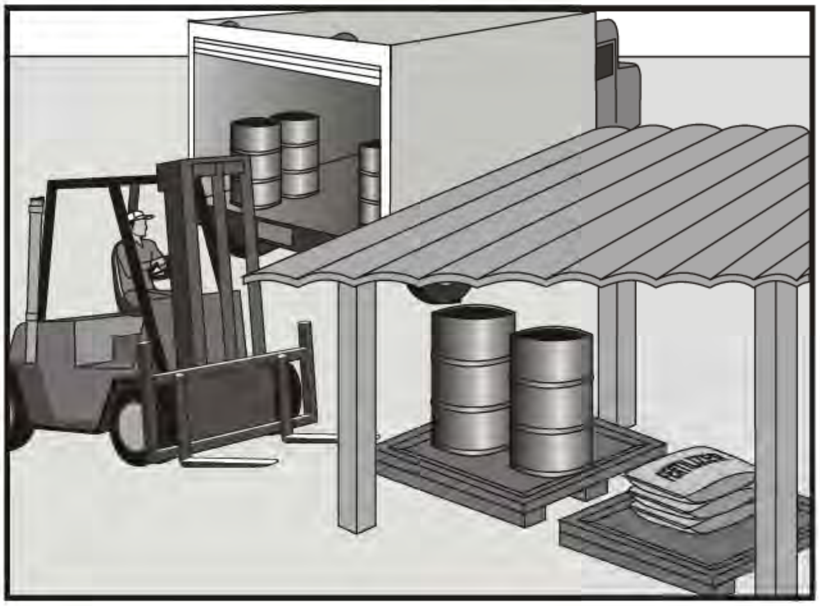
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.

References

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

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

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



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components

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- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds

- Concrete compounds

- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.

- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicular traffic.

- Material Safety Data Sheets (MSDS) should be supplied for all materials stored.

- Construction site areas should be designated for material delivery and storage.

- Material delivery and storage areas should be located near the construction entrances, away from waterways, if possible.

  - Avoid transport near drainage paths or waterways.

  - Surround with earth berms. See EC-9, Earth Dikes and Drainage Swales.

  - Place in an area which will be paved.

- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.

- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.

- Hazardous materials should be handled as infrequently as possible.

- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.

- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.

- Chemicals should be kept in their original labeled containers.

- Employees and subcontractors should be trained on the proper material delivery and storage practices.

- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.

- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.

- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.

- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.

- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.

- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, each temporary containment facility should be covered during non-working days, prior to, and during rain events.

- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.

- Stockpiles should be protected in accordance with WM-3, Stockpile Management.

- Materials should be stored indoors within existing structures or sheds when available.

- Proper storage instructions should be posted at all times in an open and conspicuous location.

- An ample supply of appropriate spill clean up material should be kept near storage areas.

- Also see WM-6, Hazardous Waste Management, for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.

- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.

- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.

- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

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

- Keep an ample supply of spill cleanup materials near the storage area.

- Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

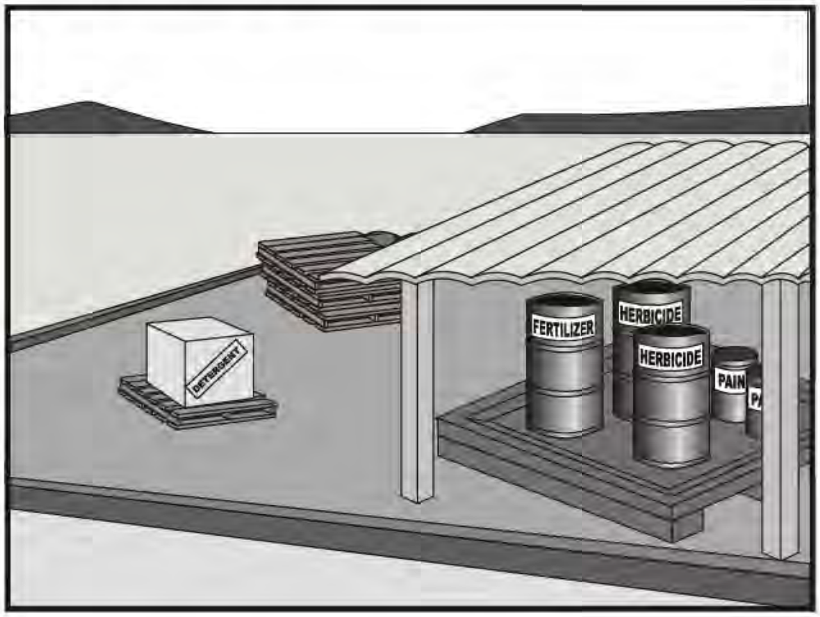
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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

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

Material Use WM-2



Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Limitations
Safer alternative building and construction products may not be available or suitable in every instance.

Implementation
The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.

- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.

- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydro seeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains.

- Train employees and subcontractors in proper material use.

- Supply Material Safety Data Sheets (MSDS) for all materials.

- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.

- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.

- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.

- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.

- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.

- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Require contractors to complete the "Report of Chemical Spray Forms" when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two–week intervals in the non-rainy season to verify continued BMP implementation.
- Maintenance of this best management practice is minimal.
- Spot check employees and subcontractors throughout the job to ensure appropriate practices are being employed.

References

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

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

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

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

Stockpile Management WM-3

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.

- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

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- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.

- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.

- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles
Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles
- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.

- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base
- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.

- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix"
- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.

- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate
- During the rainy season, treated wood should be covered with plastic or comparable material at all times.

- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles
Active stockpiles of the identified materials should be protected further as follows:

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.

- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Costs

All of the above are low cost measures.

Inspection and Maintenance

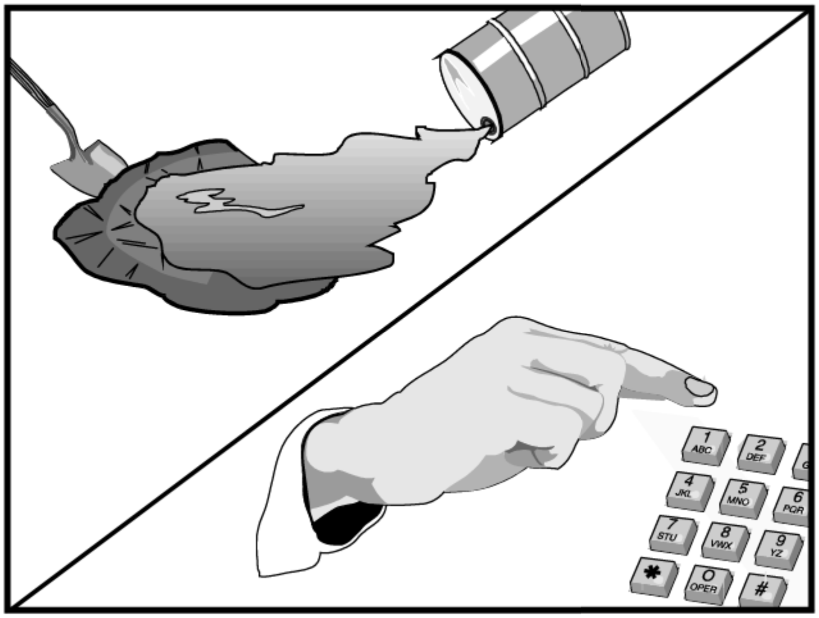
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation

- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

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

Spill Prevention and Control WM-4



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

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

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

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

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

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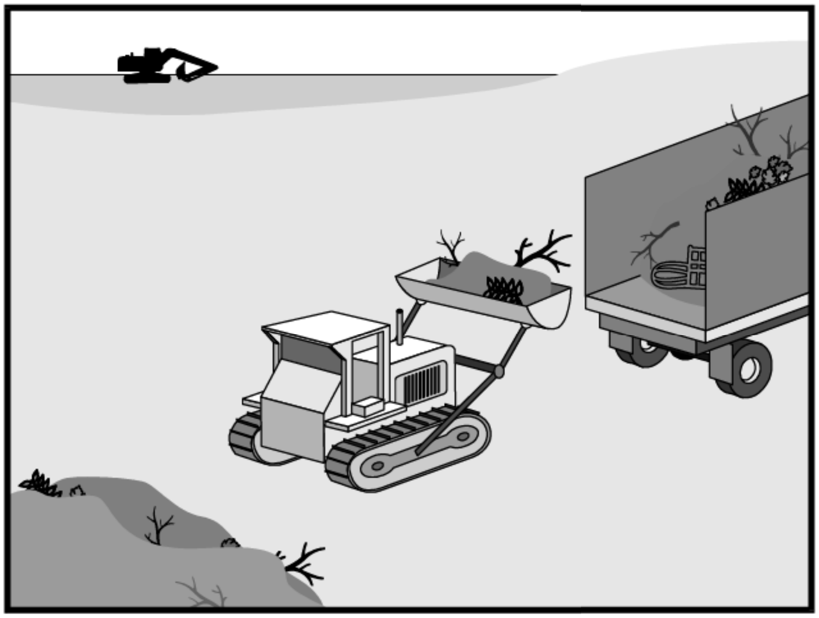

Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

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- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs
All of the above are low cost measures.

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

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

- Inspect construction waste area regularly.

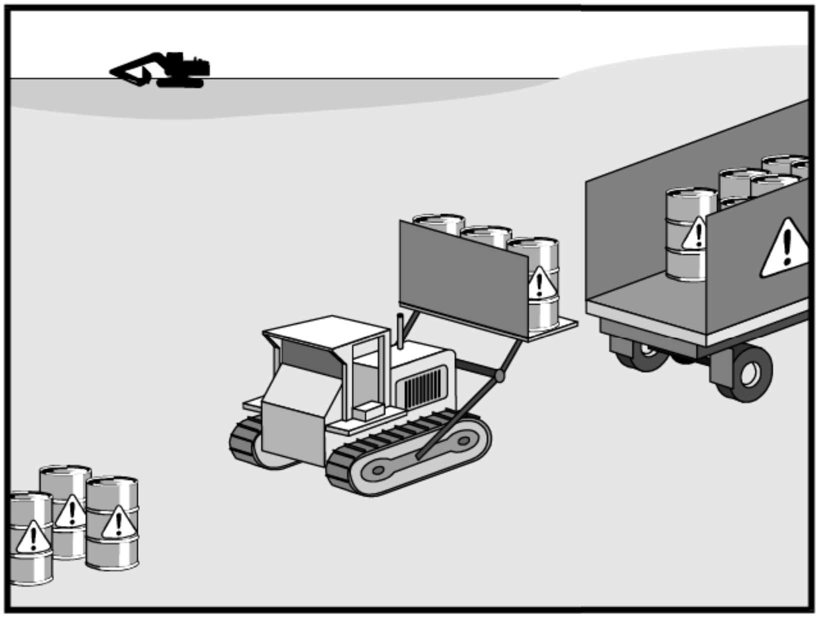
- Arrange for regular waste collection.

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

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

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

Hazardous Waste Management WM-6



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

■ Drums should not be overfilled and wastes should not be mixed.

■ Unless watertight, containers of dry waste should be stored on pallets.

■ Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

■ Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

■ Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

■ The following actions should be taken with respect to temporary contaminant:

- Ensure that adequate hazardous waste storage volume is available.

- Ensure that hazardous waste collection containers are conveniently located.

- Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

- Minimize production or generation of hazardous materials and hazardous waste on the job site.

- Use containment berms in fueling and maintenance areas and where the potential for spills is high.

- Segregate potentially hazardous waste from non-hazardous construction site debris.

- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.

- A copy of the hazardous waste manifests should be provided.

References

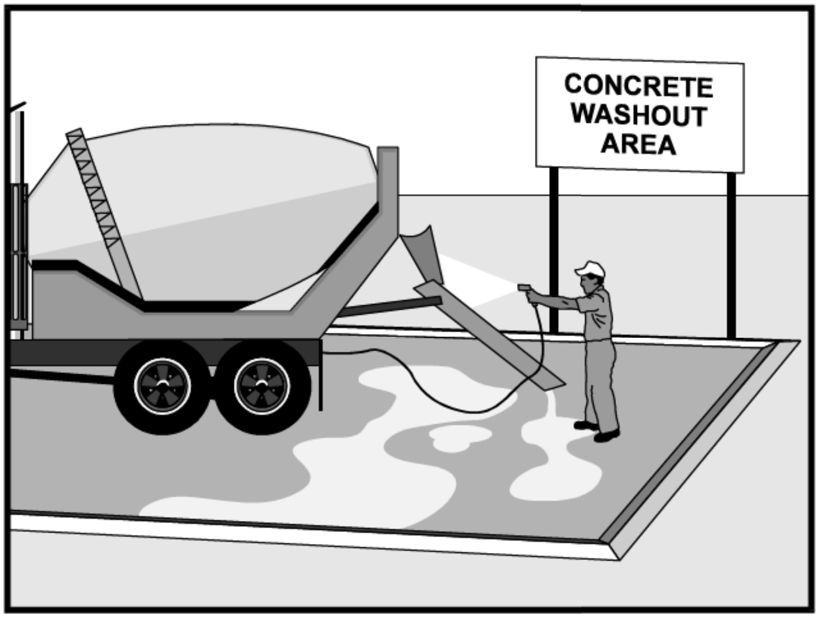
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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

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

Concrete Waste Management WM-8



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employee and subcontractors.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result form demolition activities
- Slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition
- Concrete trucks and other concrete-coated equipment are washed onsite
- Mortar-mixing stations exist
- See also NS-8, Vehicle and Equipment Cleaning

Limitations

- Offsite washout of concrete wastes may not always be possible.

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Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Perform washout of concrete trucks offsite or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Slurry residue should be vacuumed and disposed in a temporary pit (as described in OnSite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

- Washout of concrete trucks should be performed in designated areas only.

- Only concrete from mixer truck chutes should be washed into concrete wash out.

- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.

- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.

- Temporary Concrete Washout Facility (Type Above Grade)

  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.

- Straw bales, wood stakes, and sandbag materials should conform to the provisions in SE-9, Straw Bale Barrier.

- Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

■ Temporary Concrete Washout Facility (Type Below Grade)

- Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.

- Lath and flagging should be commercial type.

- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

■ When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.

■ Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

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

■ Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.

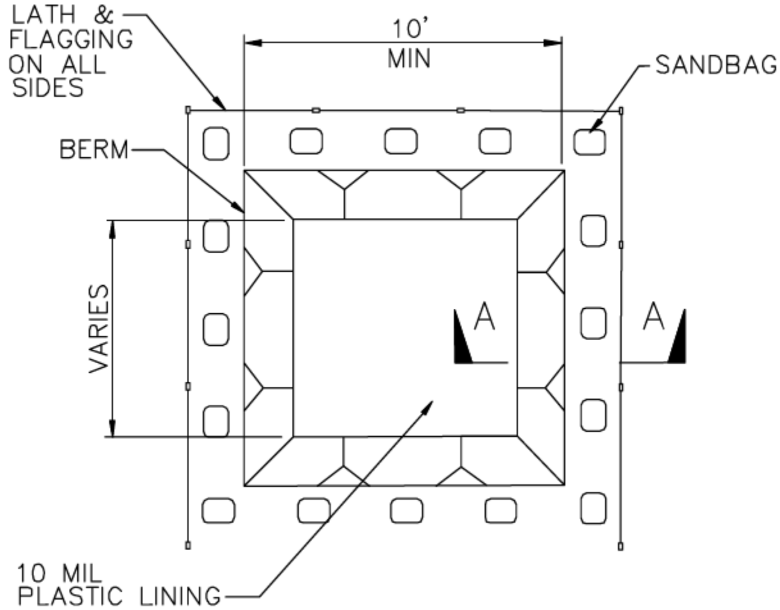
■ Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

References

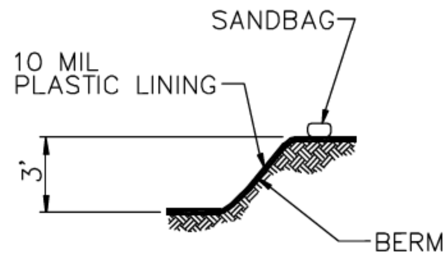
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

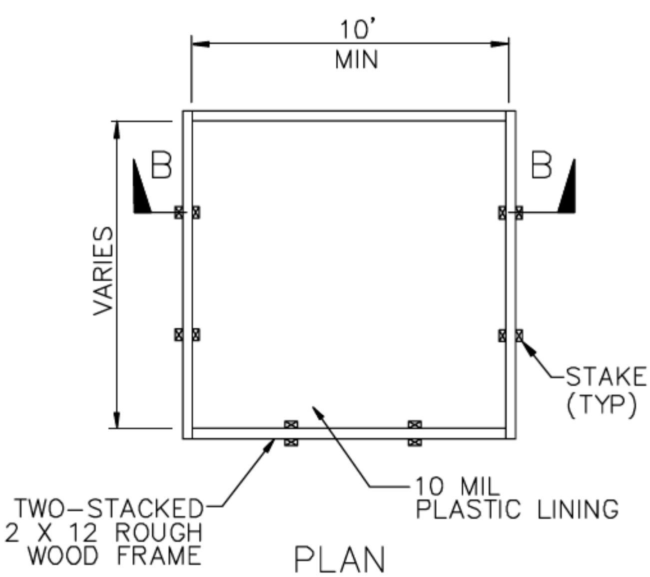
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



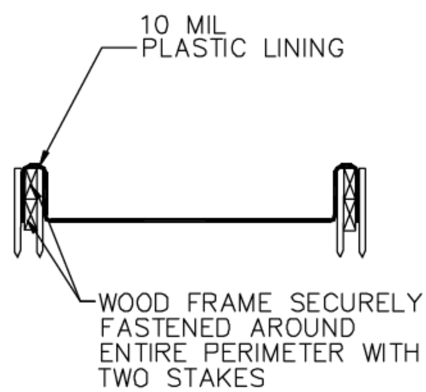
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



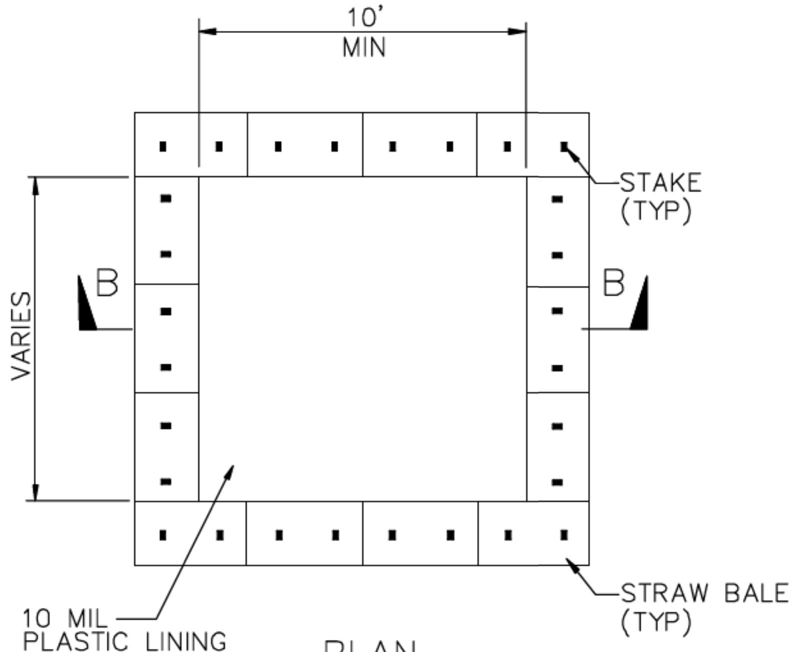
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



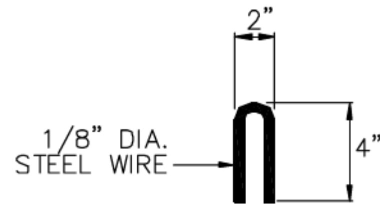
SECTION B–B
NOT TO SCALE

NOTES

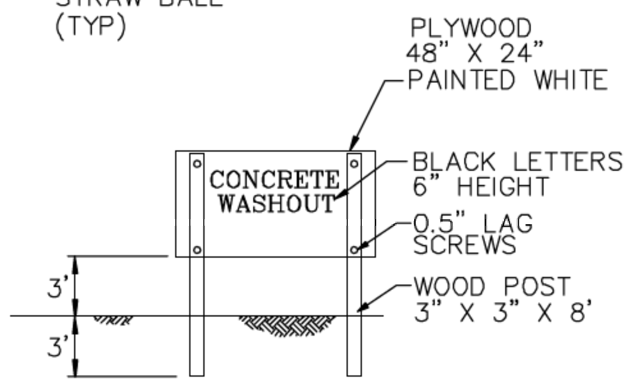
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



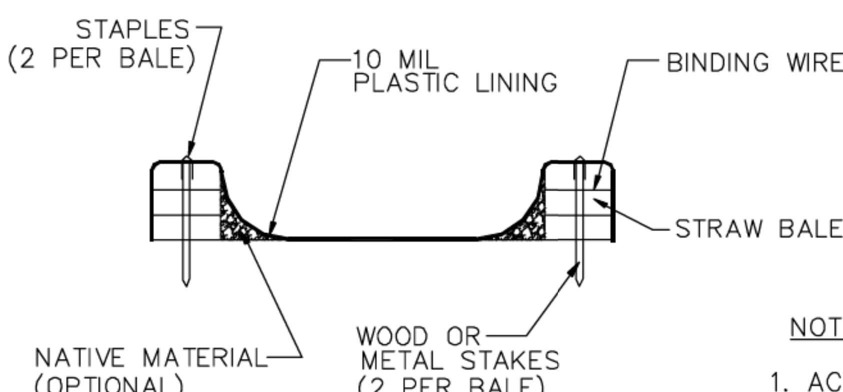
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

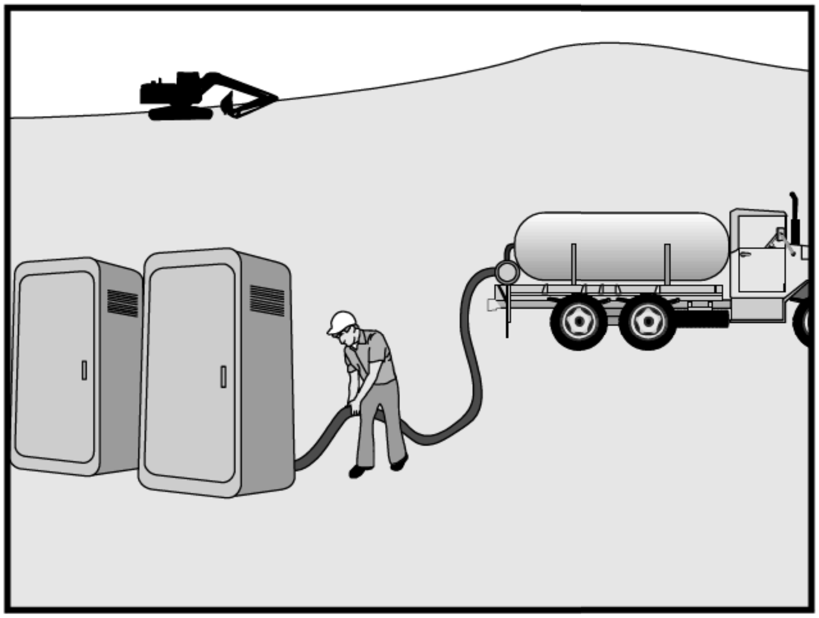


SECTION B–B
NOT TO SCALE

NOTES

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

Sanitary/Septic Waste Management WM-9



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Wastewater should not be discharged or buried within the project site.

- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.

- Only reputable, licensed sanitary and septic waste haulers should be used.

- Sanitary facilities should be located in a convenient location.

- Untreated raw wastewater should never be discharged or buried.

- Temporary septic systems should treat wastes to appropriate levels before discharging.

- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.

- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.

- Sanitary and septic facilities should be maintained in good working order by a licensed service.

- Regular waste collection by a licensed hauler should be arranged before facilities overflow.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.

- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.

- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

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

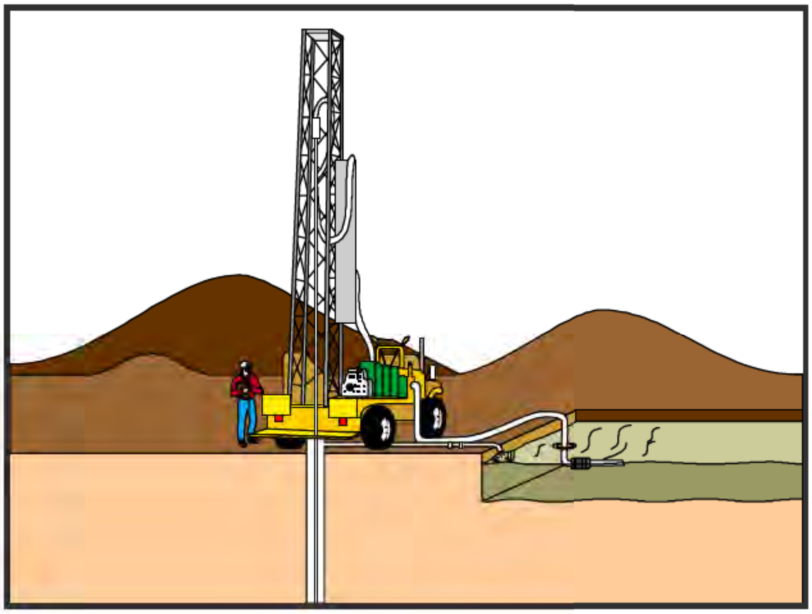
- Arrange for regular waste collection.

- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.

References

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

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



Objectives

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

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous

wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.

- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.

- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.

- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.

- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.

- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.

- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.

- Containment devices must be structurally sound and leak free.

- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

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

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

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.

- Inspect containment areas and capturing devices and repair as needed.

References

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

Attachment R

Sample Activity Log

Sample Activity Log

GENERAL INFORMATION				
Project Name				
Contract No:				
Contractor				
Sampler's Name				
Sampler's Title				
Signature				
Date of Sampling				
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Min. Hr. Days	Approximate Rainfall Amount (mm)	

Sample Log		
Sample Identification	**Sample Location**	**Collection Date and Time**

Field Analysis		
Yes		No
Sample Identification	**Test**	**Result**

Attachment S

Pollutant Testing Guidance Table – Non-Visible Pollutants

Attachment S
Pollutant Testing Guidance Table [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Asphalt Products (Sections 37, 39, 92, 93, 94, and Special Provisions)	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 Acidity Test Kit	EPA 150.1 (pH)
					SM 2310B (Acidity)
					EPA 300.0 (Anion)
	Bleaches	No	Residual Chlorine	Chlorine	SM 4500-CL G (Res. Chlorine)
	Detergents	Yes - Foam	Visually Observable - No Testing Required		
	TSP	No	Phosphate	Phosphate	EPA 365.3 (Phosphate)
	Solvents	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)

Attachment S
Pollutant Testing Guidance Table [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Portland Concrete Cement & Masonry Products (Section 27, 28, 29, 40, 41, 42, 49, 50, 51, 53, 63, 65, 72, 73, 80, 81, 83, 90, and Special Provisions)	Portland Cement (PCC)	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Masonry products	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Alkalinity		SM 2320 (Alkalinity)
	Sealant (Methyl Methacrylate - MMA)	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	Calcium Test	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 Alkalinity or Acidity Test Kit	SM 2310B (Acidity)
			Alkalinity		SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
			VOC		EPA 601 602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)

Attachment S
Pollutant Testing Guidance Table [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Landscaping and Other Products (Section 20, 24, and Special Provisions)	Aluminum Sulfate	No	Aluminum	TDS Meter Sulfate	EPA 200.8 (Metal)
			TDS		EPA 160.1 (TDS)
			Sulfate		EPA 300.0 (Sulfate)
	Sulfur-Elemental	No	Sulfate	Sulfate	EPA 300.0 (Sulfate)
	Fertilizers-Inorganic [4]	No	Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Phosphate	Phosphate	EPA 365.3 (Phosphate)
			Organic Nitrogen	None	EPA 351.3 (TKN)
			Potassium	None	EPA 200.8 (Metal)
	Fertilizers-Organic	No	TOC	Nitrate	EPA 415.1 (TOC)
			Nitrate		EPA 300.0 (Nitrate)
			Organic Nitrogen		EPA 351.3 (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 Alkalinity or Acidity Test Kit	SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)

Attachment S
Pollutant Testing Guidance Table [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Painting Products (Section 12-3.08, 20-2.32, 50-1.05, 59, 91, and Special Provisions)	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		

Attachment S
Pollutant Testing Guidance Table [1]

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	SM 4500-CL G (Res. Chlorine)
Adhesives	Adhesives	No	COD	None	EPA 410.4 (COD)
			Phenols	Phenol	EPA 420.1 (Phenol)
			SVOC	None	EPA 625 (SVOC)
Dust Palliative Products (Section 18)	Salts (Magnesium Chloride, Calcium Chloride, and Natural Brines)	No	Chloride	Chloride	EPA 300.0 (Chloride)
			TDS	TDS Meter	EPA 160.1 (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 Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
	Fuels, Oils, Lubricants	Yes - Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		

Attachment S
Pollutant Testing Guidance Table [1]

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	EPA 405.1 (BOD)
			COD	None	EPA 410.4 (COD)
			DOC	None	EPA 415.1 (DOC)
			Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Nickel	None	EPA 200.8 (Metal)
	Straw/Mulch	Yes - Solids	Visually Observable - No Testing Required		
	Lignin Sulfonate	No	Alkalinity	Alkalinity	SM 2320 (Alkalinity)
			TDS	TDS Meter	EPA 160.1 (TDS)
	Psyllium	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
	Guar/Plant Gums	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
			Nickel		EPA 200.8 (Metal)
	Gypsum	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Calcium	Calcium	EPA 200.7 (Calcium)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Aluminum	None	EPA 200.8 (Metal)
			Barium		
			Manganese		
			Vanadium		

Attachment S
Pollutant Testing Guidance Table [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Treated Wood Products (Section 58, 80-3.01B(2), and Special Provisions)	Ammoniacal-Copper-Zinc-Arsenate (ACZA) Copper-Chromium-Arsenic (CCA) Ammoniacal-Copper-Arsenate (ACA) Copper Naphthenate	No	Arsenic Total Chromium Copper Zinc	Total Chromium	EPA 200.8 (Metal)
	Creosote	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		

Notes:

1. 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, 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 (ADL)
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 , and Soil Master WR .

Acronyms:

BOD Biochemical Oxygen Demand
COD Chemical Oxygen Demand
DOC Dissolved Organic Carbon
EPA Environmental Protection Agency
HACH Worldwide company that provides advanced analytical systems and technical support for water quality testing.

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory

SM Standard Method
SVOC Semi-Volatile Organic Compounds
TDS Total Dissolved Solids
TKN Total Kjeldahl Nitrogen
TOC Total Organic Carbon
TSP Tri-Sodium Phosphate
VOC - Volatile Organic Compounds

References:

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

Attachment T

Discharge Reporting Log

Discharge Reporting Log

Project Name: ______________________________

Contract No: ______________________________

Date	Material(s) Discharged	Estimated Quantity	Observed By

SOIL AND WATER RESOURCES

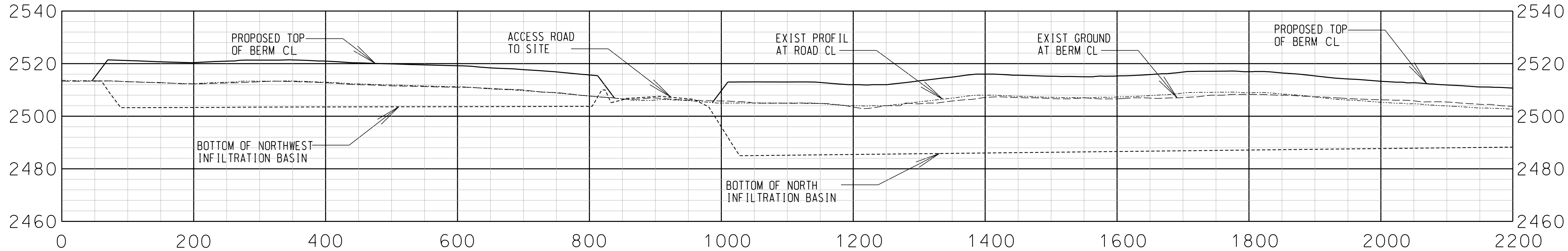
Attachment S&W-2

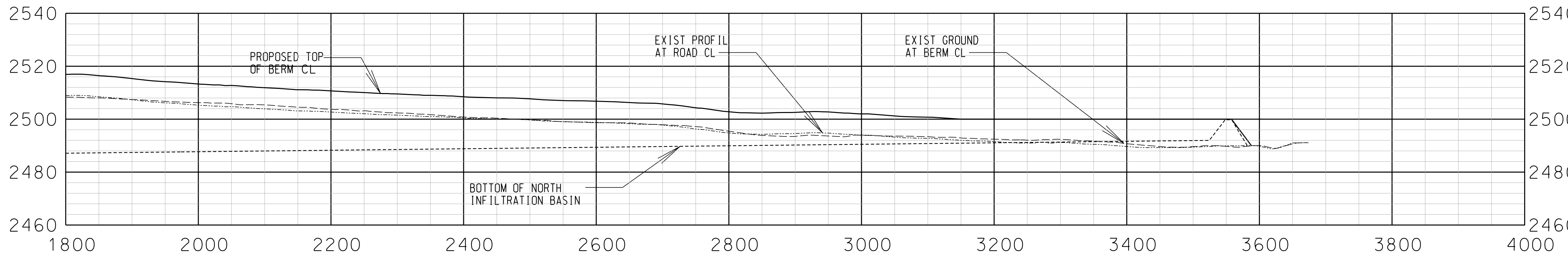
PHPP Plant Screening Berm Profile
(Kiewit Drawing SKC-2007-021-CM-501)

PHPP Conceptual Site Layout
(Kiewit Drawing SKC-2001-021-CM-500)

NOTES:

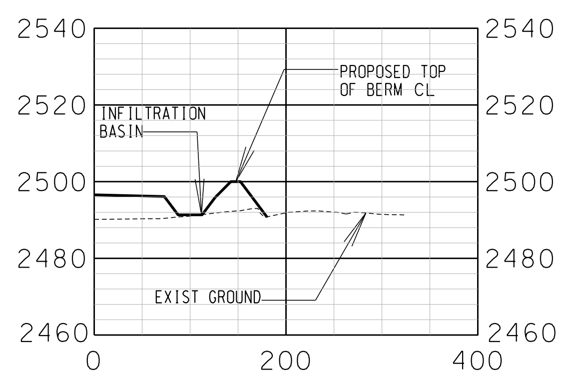
1. 8' TALL BERM IS DESIGNED TO RESTRICT VIEW OF SOLAR PANELS FROM AVENUE M.
1. A TYPICAL SECTION OF THE BERM WITH DIMENSIONS IS SHOWN ON CONCEPT SITE LAYOUT.





PROFILE VIEW OF BERM ALONG AVENUE M (WEST TO EAST)

- PRELIMINARY -
NOT FOR CONSTRUCTION



SECTION VIEW OF BERM ALONG AVENUE M AT STA 3200

100 0 100 200
SCALE IN FEET
SCALE: 1" = 100' HORIZONTAL
1"=25' VERTICAL

REV	DESCRIPTION	DWN	CHK	APP	DATE
A	ISSUE FOR REVIEW	AHG			12-16-09

CITY OF PALMDALE

PALMDALE HYBRID
POWER PROJECT

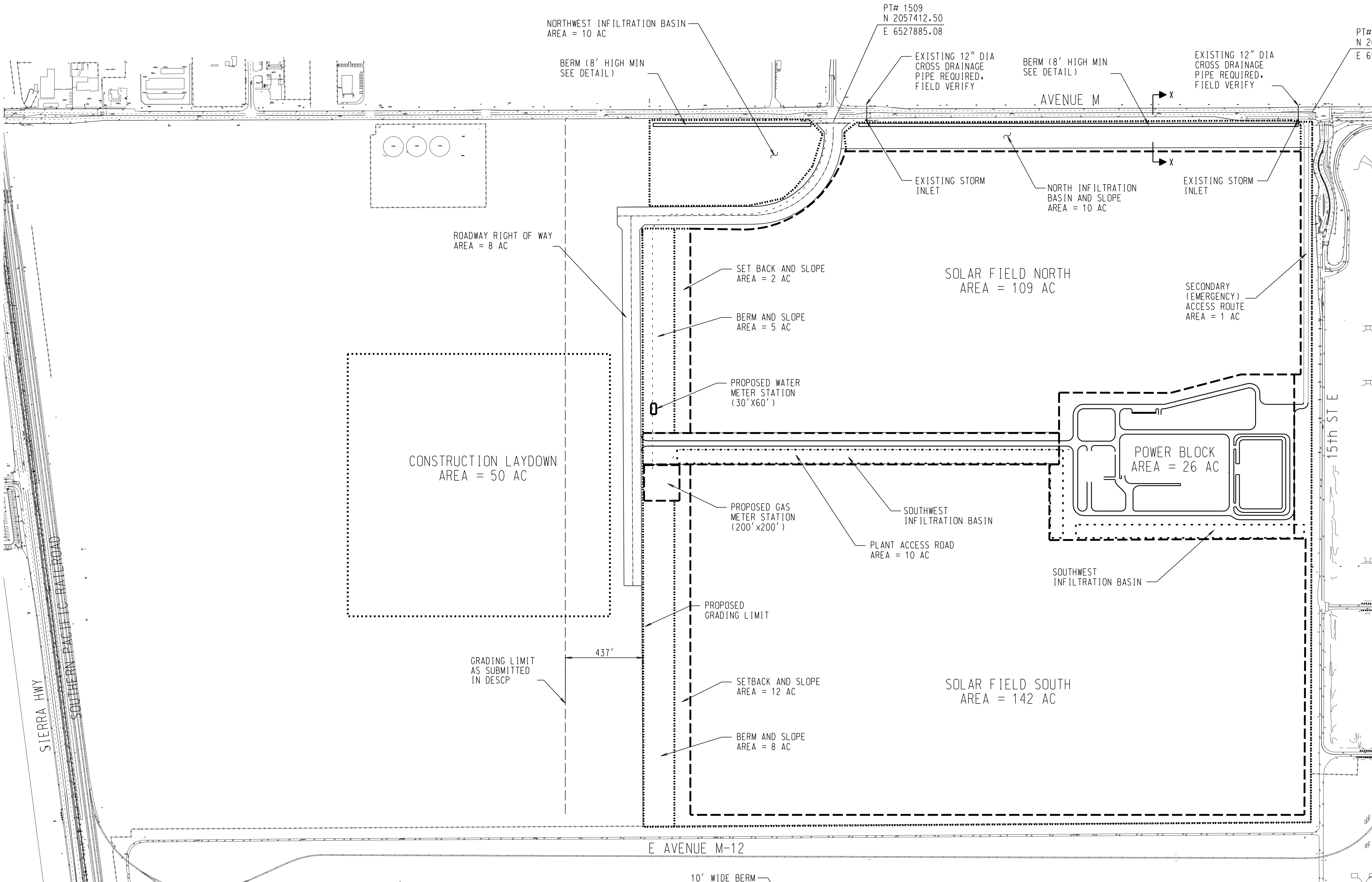
Kiewit

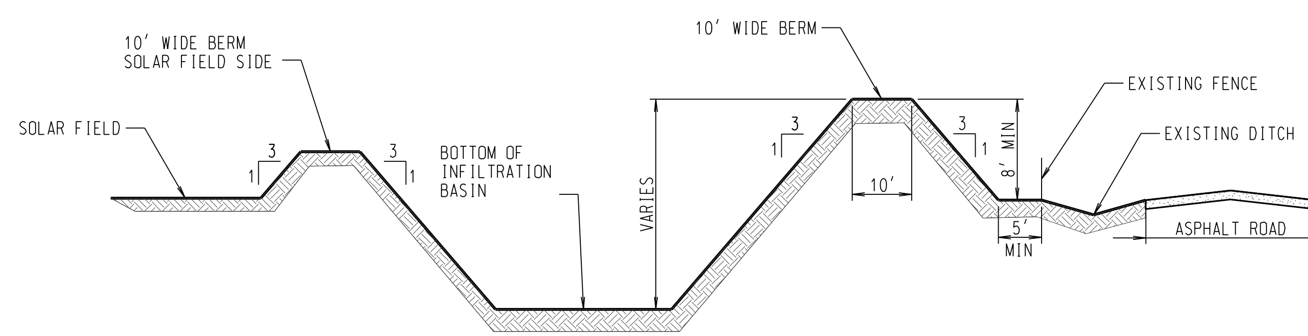
Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

CONCEPT DESIGN OF BERM

	by	date
DESIGNED	AHG	12-16-09
DRAWN	AHG	12-16-09
CHECKED		
APPROVED		

DRAWING NUMBER
SKC-2007-021-CM-501





SECTION X-X BERM ALONG AVENUE M
SCALE: NTS

300 0 300 600
SCALE IN FEET
SCALE: 1" = 300'

NOTES:

1. STACK COORDINATES-

HRSG 1:
STATE PLANE GROUND COORDINATE
N: 2055300.000
E: 6529671.000

GEOGRAPHIC COORDINATE (NAD 83)
LATITUDE: 35 38 23.91803
LONGITUDE: 118 06 22.94693

BASE ELEVATION: 2517

HRSG 2:
STATE PLANE GROUND COORDINATE
N: 2055435.000
E: 6529671.000

GEOGRAPHIC COORDINATE (NAD 83)
LATITUDE: 34 38 25.25346
LONGITUDE: 118 06 22.94864

BASE ELEVATION: 2517

- PRELIMINARY -
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DWN	CHK	APP	DATE
B	ADDED BERM DETAIL	MTW			07-30-09
A	ISSUE FOR REVIEW	MTW			04-15-09

CITY OF PALMDALE

PALMDALE HYBRID
POWER PROJECT

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

CONCEPTUAL SITE LAYOUT

	by	date
DESIGNED	MDM	01-06-09
DRAWN	MDM	01-06-09
CHECKED		
APPROVED		

DRAWING NUMBER
2007-021-CM-500

<u>SOIL AND WATER RESOURCES</u>

Attachment S&W-3

PHPP Recycled Water Project Agreement

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

GAIL FARBER, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: WW-1

March 9, 2010

Mr. Michael Mischel
Director of Public Works
City of Palmdale
38300 Sierra Highway
Palmdale, CA 93550-4798

Dear Mr. Mischel:

NORTH LOS ANGELES COUNTY REGIONAL RECYCLED WATER PROJECT AGREEMENT

Enclosed are two originals of the agreement between the Los Angeles County Waterworks District No. 40, Antelope Valley, and the City of Palmdale to construct a portion of the North Los Angeles County Regional Recycled Water Project.

If you have any questions, please contact Mr. Jonathan King at (626) 300-3389.

Very truly yours,

GAIL FARBER
Director of Public Works

FOR ADAM ARIKI
Assistant Deputy Director
Waterworks Division

DR:cr
LTS36 - North LA County Regional Recycled Water Agmt Transmittal Ltr

Enc.

AGREEMENT BETWEEN LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40 AND THE CITY OF PALMDALE TO DESIGN AND CONSTRUCT A PORTION OF THE NORTH LOS ANGELES COUNTY REGIONAL RECYCLED WATER PROJECT

THIS Agreement, ("AGREEMENT") made and entered into on this 8th day of March, 2010, by and between the City of Palmdale, (hereinafter referred to as "CITY"), and Los Angeles County Waterworks District No. 40, Antelope Valley, (hereinafter referred to as "DISTRICT,") and together hereinafter referred to as "PARTIES":

DEFINITIONS:

RECYCLED WATER: For the purposes of this AGREEMENT recycled water will be considered disinfected tertiary treated recycled water meeting Title 22 standards (hereinafter referred to as "recycled water"); and

PROJECT: The PROJECT which is the subject of this AGREEMENT is a portion of the North Los Angeles/Kern County Regional Recycled Water Project to provide the primary backbone system for distribution of recycled water to end users in the Antelope Valley (Regional Project) as that project is described in the Final Program Environmental Impact Report SCH. No. 2007101125 prepared by the DISTRICT in conjunction with the CITY and other agencies and certified on December 9, 2008. The portion of that Regional Project which is the subject of this AGREEMENT and for the purposes of this AGREEMENT is referred to herein as the PROJECT is as follows:

1) Approximately 46,000 linear feet of 24-inch-diameter (backbone) pipeline commencing at Los Angeles County Sanitation District No. 20's Palmdale Water Reclamation Plant (PWRP), heading north along 30th Street East to Rancho Vista Blvd (Avenue P), westerly to 10th Street East, northerly along 10th Street East to Avenue O-8, westerly along Avenue O-8 to Sierra Highway, continuing northerly along Sierra Highway to Columbia Way (Avenue M), and continuing southwesterly along Avenue O and the Amargosa Creek from Sierra Highway to the DISTRICT'S existing tank site facility at 1054 West Avenue P, and connecting to the DISTRICT's tanks; and

2) Approximately 4,700 linear feet of 16-inch-diameter lateral pipeline from Sierra Highway along Avenue M to the Palmdale Hybrid Power Plant (PHPP) at Challenger Way (10th Street East); and

3) The DISTRICT's 850 horsepower (HP) pump station and appurtenant facilities at the PWRP, which will pump up to 9,200 gallons per minute (gpm), of recycled water into said backbone pipeline; and

4) The DISTRICT's one million gallon (MG) forebay tank located at the PWRP.

WITNESSETH

WHEREAS, the PARTIES support the State's policy for the beneficial reuse of recycled water to replace potable water where possible, in accordance with the California Water Code Sections 13510 *et seq.* which states in part as follows:

"There is a need for a reliable source of water for uses not related to the supply of potable water to protect investments in agriculture, greenbelts, and recreation and to replenish groundwater basins ..." Water Code § 13576(c).

"The use of recycled water is a cost-effective, reliable method of helping to meet California's water supply needs." Water Code § 13576(f).

"The development of the infrastructure to distribute recycled water will provide jobs and enhance the economy of the state." Water Code § 13576(g).

"Retail water suppliers and recycled water producers and wholesalers should promote the substitution of recycled water for potable water and imported water in order to maximize the appropriate cost-effective use of recycled water in California." Water Code § 13576(h).

"The Legislature finds and declares that a substantial portion of the future water requirements of this state may be economically met by beneficial use of recycled water. [¶] The Legislature further finds and declares that the utilization of recycled water by local communities for domestic, agricultural, industrial, recreational, and fish and wildlife purposes will contribute to the peace, health, safety and welfare of the people of the state. Use of recycled water constitutes the development of "new basic water supplies" as that term is used in Chapter 5 (commencing with Section 12880) of Part 6 of Division 6." Water Code § 13511.

"It is the intention of the Legislature that the state undertake all possible steps to encourage development of water recycling facilities so that recycled water may be made available to help meet the growing water requirements of the state." Water Code § 13512; and

WHEREAS, the PROJECT will provide for a portion of the primary backbone system for distribution of recycled water to end users in the Antelope Valley; and

WHEREAS, the PROJECT will reduce each PARTY'S dependence on imported water; and

WHEREAS, the PROJECT will augment local water supplies and conserve potable water; and

WHEREAS, the PROJECT will promote the State's policies for beneficial reuse of recycled water to replace potable water where possible; and

WHEREAS, the DISTRICT has contracted with County Sanitation Districts of Los Angeles County Nos. 14, Lancaster, and 20, Palmdale, to purchase up to 13,500 acre-feet annually of recycled water, as evidenced by the attached agreement; and

WHEREAS, the PARTIES will receive direct benefits from the construction and operation of the PROJECT; and

WHEREAS, the PARTIES agree to cooperate together to complete the design and construction of the PROJECT; and

WHEREAS, the County of Los Angeles Board of Supervisors authorized the DISTRICT to enter into a Consultant Services Agreement with Environmental Science Associates (ESA) for all required CEQA/NEPA compliance for the PROJECT; and

WHEREAS, the PARTIES estimate the design and construction of the PROJECT will cost approximately 14.6 million dollars which will be paid for in the following manner:

The DISTRICT will pay the full cost of design from its recycled water fund of approximately $5.5 million dollars and will contribute the remaining balance in that fund (estimated at $3.5 million dollars), after design costs, to the CONSTRUCTION COSTS OF PROJECT. In addition, the DISTRICT will pay the costs of contract administration for design and construction (estimated at $1.5 million dollars) to be paid by the Waterworks District 40 general fund.

The CITY will advance the remaining costs of construction of the PROJECT (estimated at $9.1 million dollars) subject to reimbursement, as provided in this AGREEMENT .

WHEREAS, the PARTIES were equal partners in preparing a Program Environmental Impact Report "PEIR" to achieve environmental compliance for the PROJECT; and

WHEREAS, the DISTRICT, as lead agency, has adopted the Final PEIR, as evidenced by the attached resolution; and

WHEREAS, the DISTRICT shall be lead agency in implementing the PROJECT; and

WHEREAS, the DISTRICT has adopted Rules and Regulations in the "Waterworks Rules and Regulations" to address the distribution and sale of recycled water in the DISTRICT's service area; and

WHEREAS, the PARTIES desire to cooperatively engage in recycled water planning and jointly analyze proposed project elements; and

WHEREAS, the CITY is planning to construct, own, and operate the PHPP; and

WHEREAS, the CITY's PHPP will be located within the DISTRICT's service area, and the DISTRICT is the retail recycled water supplier to the PHPP; and

WHEREAS, the California Energy Commission requires the CITY's PHPP to have a reliable source of recycled water over the life of the PHPP; and

WHEREAS, the DISTRICT has already committed to provide 4,121 acre-feet per year of recycled water to the CITY's PHPP as required for 100% capacity operations; and to provide to the PHPP 3,091 acre-feet per year of recycled water as required for operation at an annual average of 75% capacity; and

WHEREAS, the PROJECT is being designed and constructed to accommodate the recycled water needs as identified in the Regional Project and the CITY's needs for recycled water for the PHPP; and

NOW, THEREFORE, in consideration of the benefits to be derived by the PARTIES and of the promises herein contained, it is hereby agreed as follows:

(1) CITY AGREES:

a) To contribute $3,800,000 (in 2009 dollars) towards the PROJECT construction costs, in proportion to the CITY's estimated share of the PROJECT COST (i.e. 28% of the backbone pipeline, pump station and forebay, and 100% of the PHPP lateral), to fund the following aspects of the PROJECT:

   i. An 850 HP pump station to provide 9,200 gpm of recycled water to serve the PHPP and the DISTRICT'S service area.

   ii. Approximately 33,000 linear feet (LF) of 24-inch-diameter pipeline from the PWRP to the PHPP lateral at Sierra Highway and Columbia Way (Avenue M).

   iii. A 1 million gallon forebay tank at the PWRP.

   iv. Approximately 4,700 LF of a 16-inch-diameter pipeline in Columbia Way from Sierra Highway to the PHPP.

   v. Jack and bore of 320 LF of 5/8-inch-thick 48-inch-diameter steel casing under the railroad crossing at Sierra Highway and Avenue O-8.

   vi. Jack and bore of 320 LF of 5/8-inch-thick 24-inch-diameter steel casing under the railroad crossing at Sierra Highway and Columbia Way.

   vii. Soft costs and force account work necessary to construct the PROJECT.

b) To deposit a total of $9,100,000 (in 2009 dollars) with the DISTRICT within thirty (30) days of awarding the construction contract for the PROJECT to cover the estimated PROJECT COST over and above the DISTRICT'S contribution.

c) To supplement the initial deposit within 60 days of a request by the DISTRICT to cover the balance of the PROJECT COST, if the actual PROJECT COST exceeds the current estimate of $14,600,000 (in 2009 dollars).

d) To prepare, review, and approve future grant applications for implementation of the PROJECT.

e) That DISTRICT will have sole authority to contract for an access charge pursuant to Public Contracts §§ 20600 et seq.

f) That any contract on assessments under Public Contracts Code § 20600 are not commodities to be traded or sold and no interest shall accrue thereon.

(2) DISTRICT AGREES:

a) To award and administer the contracts for the design and construction of the PROJECT pursuant to plans and specifications (hereinafter referred to as "Plans"), and to act, only after consulting with CITY, on behalf of CITY in all negotiations pertaining to the PROJECT. It is understood and agreed that the pump station shall be designed and constructed in a manner to accommodate additional pumps and a building housing the pumps to meet the needs of the Regional Project.

b) To pay the full cost of the design of the PROJECT.

c) To contribute **$5,500,000** towards the PROJECT costs.

d) To reserve the necessary capacity in the backbone system, measured in gallons per minute, to demonstrate compliance with the California Energy Commission's requirements for the PHPP.

e) To provide the PHPP with 2,562 gpm (4,121 acre-feet per year) of recycled water flow as required for 100% capacity operations.

f) To provide the PHPP with 1,916 gpm (3,091 acre-feet per year) of recycled water flow, as required for operation of the PHPP at an annual average of 75% capacity.

g) To design and construct the forebay tank at the PWRP with sufficient capacity to meet the needs of the Regional Project.

h) To design and construct the 24-inch pipeline to ensure redundancy throughout the Regional Project area.

i) To allow the CITY to review, comment on, and approve the PROJECT design and Plans.

j) To obtain and maintain all necessary State, local, or other needed regulatory approval or applicable permits.

k) To notify CITY 48 hours in advance of the start of construction of the PROJECT so that the CITY may furnish an inspector, at no cost to the DISTRICT, to inspect construction of PROJECT. DISTRICT'S inspector shall consult with CITY'S inspector with respect to PROJECT, but DISTRICT'S inspector's instructions to DISTRICT'S contractor shall be final. Any inspection or any approvals of the Plans or the PROJECT by the CITY will not relieve the DISTRICT of its obligations relating to the PROJECT.

l) To furnish for approval by the CITY, within 60 days after acceptance of PROJECT by the DISTRICT, a final accounting ("FINAL ACCOUNTING") of the actual cost of PROJECT.

m) To furnish CITY, within 60 days after acceptance of PROJECT by the DISTRICT, a reproducible set of as-built drawings of PROJECT.

n) To take all necessary steps to complete the PROJECT pursuant to the approved Plans.

o) To own, operate and maintain the PROJECT.

p) To provide the PHPP recycled water up to twenty-eight percent (28%) of the capacity of the PROJECT, at no additional cost to the CITY, except as set forth in the DISTRICTs' Waterworks Rules and Regulations.

q) To prepare, review, and approve future grant applications for implementation of the PROJECT.

r) To refer parties seeking to connect to the PROJECT in the future to the CITY to pay their proportionate reimbursement share of the PROJECT costs based on capacity to the CITY in accordance with California Public Contract Code § 20600 et seq. for a period of 10 years. Reimbursement to the CITY should not exceed the difference between the total amount paid by the CITY toward the PROJECT costs and the CITY's share of the PROJECT costs as provided in Section 1(a).

(3) IT IS MUTUALLY UNDERSTOOD AND AGREED AS FOLLOWS:

a) The CITY shall review and comment on draft and final versions of technical reports, design plans, specifications, construction documents, and revisions/addendums to the PROJECT within twenty-one (21) calendar days from the date of receipt of said documents from the DISTRICT. The CITY shall verify that the pump station is designed and constructed to accommodate future expansion to meet future demands. This accommodation shall included sizing the suction and discharge manifolds for existing and future demands and extending the manifolds so that they can be connected to future pumps outside the pump station foundation.

b) The "CONSTRUCTION COSTS OF PROJECT" shall mean payments made to third-party contractors pursuant to contracts that are competitively bid for construction of the PROJECT.

c) The CITY shall have the right to review and approve the FINAL ACCOUNTING and verify the accuracy and validity of the CONSTRUCTION COSTS OF PROJECT. The CITY reserves the right to adjust the final payment based on a review of the FINAL ACCOUNTING.

d) The DISTRICT will retain independent control and sole ownership of the PROJECT, including operating and maintenance responsibilities.

e) The DISTRICT will retain independent control and ownership of the pump station and forebay tank, including operating and maintenance responsibilities, where it resides at the PWRP.

f) The purpose of the PROJECT is to provide recycled water to the Antelope Valley in accordance with the Regional Project and the DISTRICT will operate and control the PROJECT in a manner to so provide recycled water to the entire area as contemplated by such Regional Project.

g) If CITY funds deposited with the DISTRICT exceed the CITY's share of the PROJECT costs, based upon the FINAL ACCOUNTING, such excess funds shall be refunded to the CITY within sixty (60) days of the CITY's acceptance of the FINAL ACCOUNTING.

h) If the CITY's share of the PROJECT costs exceeds the CITY funds deposited with the DISTRICT, based upon the FINAL ACCOUNTING, the CITY will supplement this AGREEMENT in proportion to the CITY's share of the PROJECT costs (28% of the backbone pipeline, pump station and forebay; **100%** of the PHPP lateral) within sixty (60) days of the DISTRICT's submission of the FINAL ACCOUNTING to the CITY.

i) The PROJECT'S actual funding gap, anticipated to be $5,300,000 (in 2009 dollars) will be covered by the CITY and is eligible for reimbursement per Public Contract Code Sections 20600 *et seq.*.

j) All Supplemental Environmental Project (SEP) Funds contributed to the PROJECT from the County Sanitation Districts of Los Angeles County, Nos. 14 and 20 ("San Districts") shall be disbursed to the CITY. However, SEP Funds will not be released by the San Districts until the PROJECT is operational to the satisfaction of the San Districts.

k) That the provisions of the existing General Services Agreement (No. 76573) shall not apply to this AGREEMENT or the PROJECT.

l) That the provisions of the existing Assumption Liability Agreement (No. 32073) shall not apply to this AGREEMENT or the PROJECT.

m) That the DISTRICT's Waterworks Rules and Regulations apply to the recycled water service provided by the DISTRICT to the CITY and PHPP.

n) This AGREEMENT may be amended or modified only by mutual written consent of both PARTIES.

o) This AGREEMENT shall have a term of ten (10) years after the date of execution, with two (2) five (5) year extensions by mutual written consent from both PARTIES prior to expiration, provided however, the DISTRICT'S obligation to provide recycled water to the CITY shall continue for the life of the PHPP as set forth in Sections 2 (d)(e)(f) of this AGREEMENT. The provisions of Sections 2(o) and 3(f) shall also survive the termination of this AGREEMENT.

p) To the extent that liability is imposed on either party pursuant to the provisions of Government Code § 895.2, each party shall indemnify, defend, protect, hold harmless, and release the other, their elected bodies, officers, agents, and employees, from and against any and all claims, losses, proceedings, damages, causes of action, liability, costs, or expense (including attorneys' fees and witness costs) arising from or in connection with, or caused by any negligent act or omission or willful misconduct of such indemnifying party. This indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages or compensation payable to or for the indemnifying party under workers' compensation acts, disability benefit acts, or other employee benefit acts. This provision shall survive termination of this AGREEMENT.

q) Any correspondence, communication, or contact concerning this AGREEMENT shall be directed to the following:

CITY OF PALMDALE: Mr. Michael J. Mischel
Public Works Director
38250 Sierra Highway
Palmdale, CA 93550

LOS ANGELES COUNTY WATERWORKS DISTRICT NO 40:
Mr. Adam Ariki
Assistant Deputy Director
Waterworks Division
County of Los Angeles

Department of Public Works
P.O. Box 1460
Alhambra, CA 91802-1460

r) The CITY reserves the right to terminate the AGREEMENT in the event that CITY is unable to obtain grant funding for the PROJECT; however, in the event that the CITY terminates the AGREEMENT, the CITY must fund all costs incurred for design and construction of the PROJECT up to the point of termination, and reasonable demobilization costs, if any.

s) The DISTRICT reserves the right to terminate the AGREEMENT for any of the following reasons:

   i. For convenience; or

   ii. If the DISTRICT, in its sole discretion, determines that the CITY is unable to fund their portion of the PROJECT within the PROJECT timeline projections; or

   iii. If the necessary environmental documents for the PROJECT facilities have not been adopted by the County of Los Angeles Board of Supervisors.

t) If the DISTRICT terminates this AGREEMENT prior to completion of the construction of the PROJECT and chooses not to complete the construction of the PROJECT within 10 years of the execution of this AGREEMENT, the DISTRICT agrees that the CITY may complete the PROJECT and in such event CITY shall be entitled to own and operate the PROJECT

u) This AGREEMENT constitutes the full and complete understanding of the parties regarding the design and construction of the PROJECT. This AGREEMENT supersedes any prior or contemporaneous agreements between the parties regarding the foregoing matters.

v) Nothing in this AGREEMENT is intended by the PARTIES to entitle the CITY to recycled water from the DISTRICT other than pursuant to paragraphs (2)(e) and (2)(f) herein.

w) Except as provided herein, this AGREEMENT is intended solely for the benefit of the CITY and the DISTRICT, not any third parties.

x) Each person signing this AGREEMENT represents to have the necessary power and authority to bind the entity on behalf of which said person is signing and the other party can rely on that representation.

y) Each PARTY has received independent legal advice from its attorneys with respect to the advisability of executing this AGREEMENT and the meaning of the provisions hereof. This AGREEMENT has been drafted through a joint effort of the PARTIES and their counsel and therefore shall not be construed against either of the Parties in its capacity as draftsperson but in accordance with its fair meaning.

IN WITNESS WHEREOF, the PARTIES hereto have caused this AGREEMENT to be executed by their respective officers, duly authorized, by CITY OF PALMDALE; and

CITY OF PALMDALE

By
Stephen H. Williams,
City Manager

APPROVED AS TO FORM:

By
William Matthew Ditzhazy
City Attorney

ATTEST:

By: Victoria L. Hancock
Victoria L. Hancock, CMC
City Clerk

LOS ANGELES COUNTY
WATERWORKS DISTRICT NO. 40

By
Gail Farber
Director

APPROVED AS TO FORM:
County Counsel

By
Deputy

TRAFFIC AND TRANSPORTATION

Attachment T&T-1

Traffic Counts and Level of Service Calculations

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

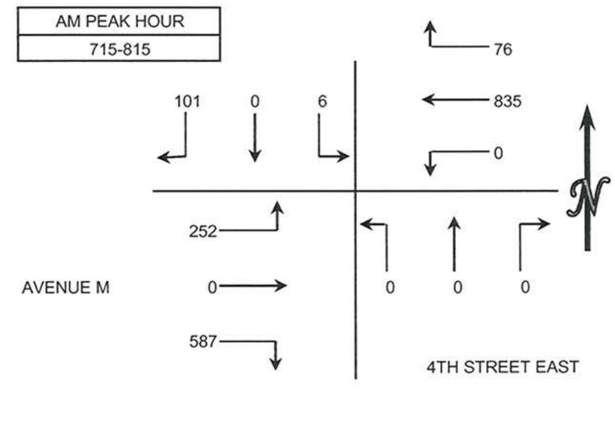
CLIENT: WILSON ENGINEERING
PROJECT: LANCASTER-PALMDALE TRAFFIC COUNTS
DATE: THURSDAY, FEBRUARY 25, 2010
PERIODS: 7:00 AM TO 9:00 AM AND 4:00 PM TO 6:00 PM
INTERSECTION: N/S 4TH STREET EAST
E/W AVENUE M
CITY: LANCASTER

15 MIN COUNTS — 7:00 AM TO 9:00 AM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-715	15	0	1	11	129	0	0	0	0	173	0	30	359
715-730	21	0	1	17	220	0	0	0	0	161	0	46	466
730-745	23	0	1	14	210	0	0	0	0	165	0	57	470
745-800	24	0	1	27	217	0	0	0	0	145	0	81	495
800-815	33	0	3	18	188	0	0	0	0	116	0	68	426
815-830	37	0	1	19	182	0	0	0	0	91	0	53	383
830-845	43	0	2	22	167	0	0	0	0	86	0	48	368
845-900	39	0	4	19	176	0	0	0	0	101	0	45	384

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-800	83	0	4	69	776	0	0	0	0	644	0	214	1790
715-815	101	0	6	76	835	0	0	0	0	587	0	252	1857
730-830	117	0	6	78	797	0	0	0	0	517	0	259	1774
745-845	137	0	7	86	754	0	0	0	0	438	0	250	1672
800-900	152	0	10	78	713	0	0	0	0	394	0	214	1561

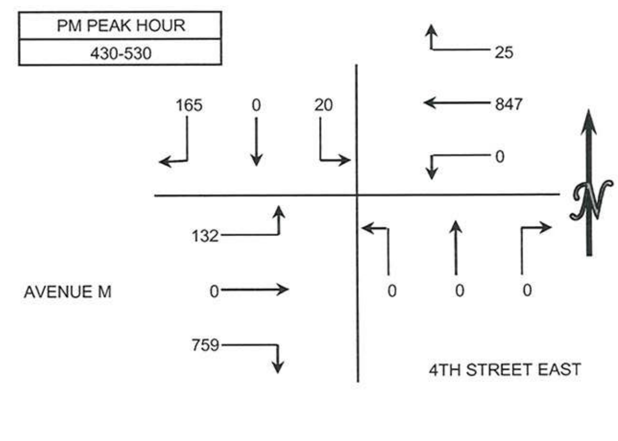


15 MIN COUNTS — 4:00 PM TO 6:00 PM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-415	44	0	1	6	229	0	0	0	0	156	0	40	476
415-430	39	0	6	12	231	0	0	0	0	133	0	44	465
430-445	47	0	5	6	215	0	0	0	0	190	0	33	496
445-500	38	0	2	6	237	0	0	0	0	180	0	38	501
500-515	35	0	8	6	205	0	0	0	0	175	0	33	462
515-530	45	0	5	7	190	0	0	0	0	214	0	28	489
530-545	37	0	0	9	181	0	0	0	0	196	0	39	462
545-600	40	0	4	6	158	0	0	0	0	187	0	39	434

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-500	168	0	14	30	912	0	0	0	0	659	0	155	1938
415-515	159	0	21	30	888	0	0	0	0	678	0	148	1924
430-530	165	0	20	25	847	0	0	0	0	759	0	132	1948
445-545	155	0	15	28	813	0	0	0	0	765	0	138	1914
500-600	157	0	17	28	734	0	0	0	0	772	0	139	1847



WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

CLIENT:		WILSON ENGINEERING
PROJECT:		LANCASTER-PALMDALE TRAFFIC COUNTS
DATE:		THURSDAY, FEBRUARY 25, 2010
PERIODS:		7:00 AM TO 9:00 AM AND 4:00 PM TO 6:00 PM
INTERSECTION:	N/S	10TH STREET WEST
	E/W	AVENUE L
CITY:		LANCASTER

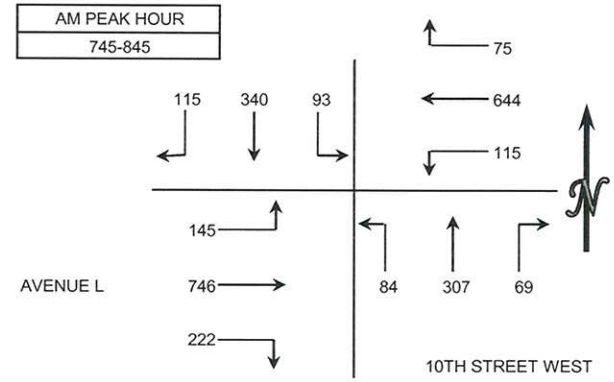
15 MIN COUNTS — 7:00 AM TO 9:00 AM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-715	25	27	23	9	185	16	8	29	7	20	147	21	517
715-730	16	40	22	10	148	12	17	44	11	20	175	23	538
730-745	29	47	28	13	137	11	26	67	16	41	226	36	677
745-800	22	76	32	15	168	29	22	78	24	59	251	32	808
800-815	33	69	23	22	145	19	11	64	20	65	210	37	718
815-830	28	93	18	18	173	29	14	82	21	43	152	35	706
830-845	32	102	20	20	158	38	22	83	19	55	133	41	723
845-900	41	104	26	19	143	19	14	98	25	56	109	36	690

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-800	92	190	105	47	638	68	73	218	58	140	799	112	2540
715-815	100	232	105	60	598	71	76	253	71	185	862	128	2741
730-830	112	285	101	68	623	88	73	291	81	208	839	140	2909
745-845	115	340	93	75	644	115	69	307	84	222	746	145	2955
800-900	134	368	87	79	619	105	61	327	85	219	604	149	2837

AM PEAK HOUR
745-845



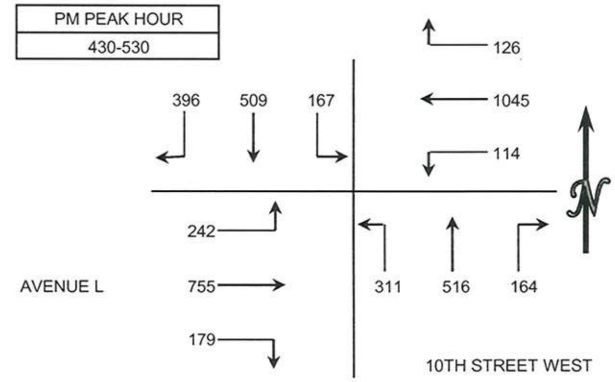
15 MIN COUNTS — 4:00 PM TO 6:00 PM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-415	93	138	42	31	240	40	31	117	69	42	173	89	1105
415-430	76	112	47	40	219	25	32	152	72	48	158	56	1037
430-445	98	118	46	36	261	29	42	139	94	49	191	64	1167
445-500	103	134	39	23	250	27	38	132	83	49	202	73	1153
500-515	109	136	47	35	284	29	46	137	52	39	188	52	1154
515-530	86	121	35	32	250	29	38	108	82	42	174	53	1050
530-545	100	126	49	40	237	29	39	128	80	30	202	53	1113
545-600	90	113	62	35	196	21	25	102	65	20	207	57	993

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-500	370	502	174	130	970	121	143	540	318	188	724	282	4462
415-515	386	500	179	134	1014	110	158	560	301	185	739	245	4511
430-530	396	509	167	126	1045	114	164	516	311	179	755	242	4524
445-545	398	517	170	130	1021	114	161	505	297	160	766	231	4470
500-600	385	496	193	142	967	108	148	475	279	131	771	215	4310

PM PEAK HOUR
430-530



WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

CLIENT: WILSON ENGINEERING
PROJECT: LANCASTER-PALMDALE TRAFFIC COUNTS
DATE: THURSDAY, FEBRUARY 25, 2010
PERIODS: 7:00 AM TO 9:00 AM AND 4:00 PM TO 6:00 PM
INTERSECTION: N/S BUSINESS CENTER PARKWAY
E/W AVENUE L
CITY: LANCASTER

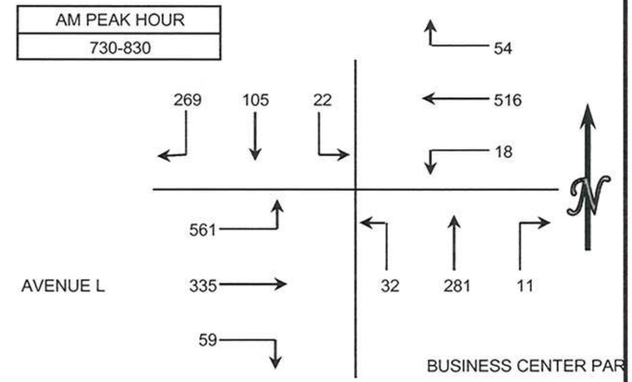
15 MIN COUNTS — 7:00 AM TO 9:00 AM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-715	59	12	5	18	126	7	3	41	7	5	80	102	465
715-730	44	17	6	18	103	2	3	60	5	5	76	119	458
730-745	60	19	7	11	136	4	0	52	4	9	105	149	556
745-800	66	23	7	20	133	7	2	92	4	16	94	169	633
800-815	62	30	5	11	110	3	5	75	8	20	79	140	548
815-830	81	33	3	12	137	4	4	62	16	14	57	103	526
830-845	86	38	8	17	109	4	4	57	4	9	55	102	493
845-900	61	26	11	6	118	11	4	77	4	4	70	109	501

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
700-800	229	71	25	67	498	20	8	245	20	35	355	539	2112
715-815	232	89	25	60	482	16	10	279	21	50	354	577	2195
730-830	269	105	22	54	516	18	11	281	32	59	335	561	2263
745-845	295	124	23	60	489	18	15	286	32	59	285	514	2200
800-900	290	127	27	46	474	22	17	271	32	47	261	454	2068

AM PEAK HOUR
730-830



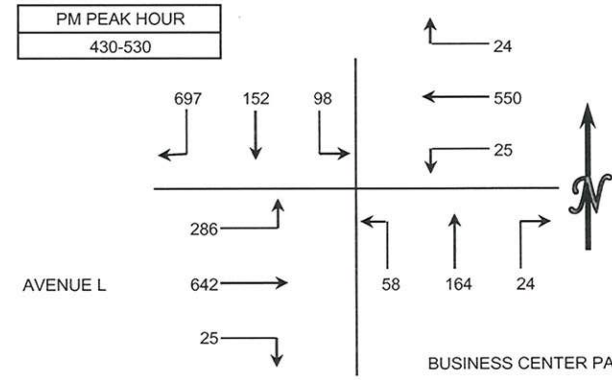
15 MIN COUNTS — 4:00 PM TO 6:00 PM

PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-415	151	33	26	5	135	5	2	41	10	8	151	67	634
415-430	136	32	21	10	128	5	5	39	16	12	134	75	613
430-445	199	42	25	8	118	5	4	39	10	9	157	92	708
445-500	146	34	18	3	174	12	2	38	11	2	141	62	643
500-515	191	37	30	7	149	1	9	46	16	6	190	76	758
515-530	161	39	25	6	109	7	9	41	21	8	154	56	636
530-545	172	46	19	4	90	8	2	39	9	2	196	88	675
545-600	105	38	10	15	93	7	5	47	12	4	188	96	620

HOUR TOTALS

TIME	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
400-500	632	141	90	26	555	27	13	157	47	31	583	296	2598
415-515	672	145	94	28	569	23	20	162	53	29	622	305	2722
430-530	697	152	98	24	550	25	24	164	58	25	642	286	2745
445-545	670	156	92	20	522	28	22	164	57	18	681	282	2712
500-600	629	160	84	32	441	23	25	173	58	20	728	316	2689

PM PEAK HOUR
430-530



AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #5 Challenger Way/E Ave L

Cycle (sec):	60	Critical Vol./Cap.(X):	0.296
Loss Time (sec):	0	Average Delay (sec/veh):	10.8
Optimal Cycle:	26	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Prot+Permit			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0 0 1 0			1 0 1 0 1			1 0 1 0 1			1 0 1 0 1		
Volume Module:												
Base Vol:	42	124	30	11	231	218	84	181	11	28	190	14
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	42	124	30	11	231	218	84	181	11	28	190	14
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	44	131	32	12	243	229	88	191	12	29	200	15
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	44	131	32	12	243	229	88	191	12	29	200	15
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	44	131	32	12	243	229	88	191	12	29	200	15
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.50	0.97	0.97	0.58	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Lanes:	1.00	0.81	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	948	1486	359	1098	1900	1615	1805	1900	1615	1805	1900	1615
Capacity Analysis Module:												
Vol/Sat:	0.05	0.09	0.09	0.01	0.13	0.14	0.05	0.10	0.01	0.02	0.11	0.01
Crit Moves:						****	****				****	
Green/Cycle:	0.48	0.48	0.48	0.48	0.48	0.48	0.45	0.45	0.45	0.07	0.36	0.36
Volume/Cap:	0.10	0.18	0.18	0.02	0.27	0.30	0.16	0.22	0.02	0.22	0.30	0.03
Delay/Veh:	8.6	9.0	9.0	8.2	9.5	9.7	10.0	10.3	9.2	27.1	14.2	12.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.6	9.0	9.0	8.2	9.5	9.7	10.0	10.3	9.2	27.1	14.2	12.6
LOS by Move:	A	A	A	A	A	A	A	B	A	C	B	B
HCM2kAvgQ:	1	2	2	0	3	3	1	2	0	1	3	0

Note: Queue reported is the number of cars per lane.

```
-------------------------------------------------------------------------------
                                AM Peak Hour
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
              2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #5 Challenger Way/E Ave L
*******************************************************************************
Cycle (sec):          60              Critical Vol./Cap.(X):         0.375
Loss Time (sec):       0              Average Delay (sec/veh):        13.9
Optimal Cycle:        36              Level Of Service:                  B
*******************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Y+R:          4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0   4.0
Lanes:        1  0  0  1  0    1  0  1  0  1    1  0  1  0  1    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      42  124    30   11  231   218   84  181    11   28  190    14
Growth Adj:  1.17 1.17  1.17 1.17 1.17  1.17 1.17 1.17  1.17 1.17 1.17  1.17
Initial Bse:   49  145    35   13  270   255   98  211    13   33  222    16
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95
PHF Volume:    52  152    37   14  284   268  103  222    14   34  234    17
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   52  152    37   14  284   268  103  222    14   34  234    17
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:   52  152    37   14  284   268  103  222    14   34  234    17
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  0.95 0.97  0.97 0.95 1.00  0.85 0.95 1.00  0.85 0.95 1.00  0.85
Lanes:       1.00 0.81  0.19 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Final Sat.:  1805 1486   359 1805 1900  1615 1805 1900  1615 1805 1900  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.03 0.10  0.10 0.01 0.15  0.17 0.06 0.12  0.01 0.02 0.12  0.01
Crit Moves:  ****                       ****  ****                    ****
Green/Cycle: 0.08 0.48  0.48 0.04 0.44  0.44 0.15 0.41  0.41 0.07 0.33  0.33
Volume/Cap:  0.37 0.21  0.21 0.21 0.34  0.37 0.37 0.28  0.02 0.28 0.37  0.03
Delay/Veh:   28.1  9.0   9.0 29.8 11.2  11.5 23.7 11.9  10.4 27.9 15.8  13.7
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:  28.1  9.0   9.0 29.8 11.2  11.5 23.7 11.9  10.4 27.9 15.8  13.7
LOS by Move:    C    A     A    C    B     B    C    B     B    C    B     B
HCM2kAvgQ:      1    2     2    0    4     4    2    3     0    1    4     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #5 Challenger Way/E Ave L

Cycle (sec):	60	Critical Vol./Cap.(X):	0.692
Loss Time (sec):	4	Average Delay (sec/veh):	14.8
Optimal Cycle:	OPTIMIZED	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:		Permitted			Permitted			Prot+Permit			Permitted	
Rights:		Include			Include			Include			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0 0 1 0			1 0 1 0 1			1 0 1 0 1			1 0 1 0 1		
Volume Module:												
Base Vol:	42	124	30	11	308	218	84	181	587	28	190	14
Growth Adj:	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Initial Bse:	49	145	35	13	360	255	98	211	685	33	222	16
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	52	152	37	14	379	268	103	222	722	34	234	17
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	52	152	37	14	379	268	103	222	722	34	234	17
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	52	152	37	14	379	268	103	222	722	34	234	17
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.24	0.97	0.97	0.52	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Lanes:	1.00	0.81	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	452	1486	359	980	1900	1615	1805	1900	1615	1805	1900	1615
Capacity Analysis Module:												
Vol/Sat:	0.11	0.10	0.10	0.01	0.20	0.17	0.06	0.12	0.45	0.02	0.12	0.01
Crit Moves:					****				****			
Green/Cycle:	0.28	0.28	0.28	0.28	0.28	0.28	0.63	0.63	0.63	0.03	0.45	0.45
Volume/Cap:	0.41	0.37	0.37	0.05	0.71	0.59	0.15	0.19	0.71	0.71	0.28	0.02
Delay/Veh:	19.7	17.8	17.8	15.9	24.0	20.8	5.2	4.8	10.0	68.5	10.7	9.3
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	19.7	17.8	17.8	15.9	24.0	20.8	5.2	4.8	10.0	68.5	10.7	9.3
LOS by Move:	B	B	B	B	C	C	A	A	A	E	B	A
HCM2kAvgQ:	1	3	3	0	8	5	1	2	10	2	3	0

Note: Queue reported is the number of cars per lane.

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-------------------------------------------------------------------------------
                                 PM Peak Hour
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
              2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #5 Challenger Way/E Ave L
*******************************************************************************
Cycle (sec):          60                Critical Vol./Cap.(X):         0.387
Loss Time (sec):       0                Average Delay (sec/veh):        10.9
Optimal Cycle:        30                Level Of Service:                  B
*******************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted      Prot+Permit        Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Y+R:          4.0  4.0  4.0  4.0  4.0  4.0  4.0  4.0  4.0  4.0  4.0  4.0
Lanes:        1  0  0  1  0   1  0  1  0  1   1  0  1  0  1   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      39  299   22   29  114   96  237  318   22   12  125   15
Growth Adj:  1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse:   39  299   22   29  114   96  237  318   22   12  125   15
User Adj:    1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj:     0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95 0.95
PHF Volume:    41  315   23   31  120  101  249  335   23   13  132   16
Reduct Vol:     0    0    0    0    0    0    0    0    0    0    0    0
Reduced Vol:   41  315   23   31  120  101  249  335   23   13  132   16
PCE Adj:     1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume:   41  315   23   31  120  101  249  335   23   13  132   16
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment:  0.62 0.99 0.99 0.41 1.00 0.85 0.95 1.00 0.85 0.95 1.00 0.85
Lanes:       1.00 0.93 0.07 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Sat.:  1178 1752  129  771 1900 1615 1805 1900 1615 1805 1900 1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.03 0.18 0.18 0.04 0.06 0.06 0.14 0.18 0.01 0.01 0.07 0.01
Crit Moves:       ****                     ****                     ****
Green/Cycle: 0.46 0.46 0.46 0.46 0.46 0.46 0.52 0.52 0.52 0.02 0.18 0.18
Volume/Cap:  0.08 0.39 0.39 0.09 0.14 0.13 0.32 0.34 0.03 0.34 0.39 0.05
Delay/Veh:    9.0 10.8 10.8  9.1  9.3  9.3  8.6  8.8  7.2 34.4 22.5 20.5
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh:   9.0 10.8 10.8  9.1  9.3  9.3  8.6  8.8  7.2 34.4 22.5 20.5
LOS by Move:    A    B    B    A    A    A    A    A    A    C    C    C
HCM2kAvgQ:      0    4    4    0    1    1    3    4    0    1    3    0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #5 Challenger Way/E Ave L

Cycle (sec):	60	Critical Vol./Cap.(X):	0.452
Loss Time (sec):	0	Average Delay (sec/veh):	11.3
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Prot+Permit			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	0 1	0	1 0	1 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	39	299	22	29	114	96	237	318	22	12	125	15
Growth Adj:	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Initial Bse:	46	349	26	34	133	112	277	371	26	14	146	18
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	48	368	27	36	140	118	291	391	27	15	154	18
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	48	368	27	36	140	118	291	391	27	15	154	18
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	48	368	27	36	140	118	291	391	27	15	154	18
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.60	0.99	0.99	0.36	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Lanes:	1.00	0.93	0.07	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1136	1752	129	678	1900	1615	1805	1900	1615	1805	1900	1615
Capacity Analysis Module:												
Vol/Sat:	0.04	0.21	0.21	0.05	0.07	0.07	0.16	0.21	0.02	0.01	0.08	0.01
Crit Moves:		****					****				****	
Green/Cycle:	0.46	0.46	0.46	0.46	0.46	0.46	0.52	0.52	0.52	0.02	0.18	0.18
Volume/Cap:	0.09	0.45	0.45	0.11	0.16	0.16	0.38	0.40	0.03	0.40	0.45	0.06
Delay/Veh:	9.1	11.3	11.3	9.3	9.4	9.4	8.9	9.1	7.2	36.0	23.0	20.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.1	11.3	11.3	9.3	9.4	9.4	8.9	9.1	7.2	36.0	23.0	20.6
LOS by Move:	A	B	B	A	A	A	A	A	A	D	C	C
HCM2kAvgQ:	1	5	5	0	2	1	4	5	0	1	3	0

Note: Queue reported is the number of cars per lane.

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-------------------------------------------------------------------------------
                                 PM Peak Hour
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #5 Challenger Way/E Ave L
*******************************************************************************
Cycle (sec):           60               Critical Vol./Cap.(X):        0.909
Loss Time (sec):        4               Average Delay (sec/veh):       22.0
Optimal Cycle:         77               Level Of Service:                 C
*******************************************************************************
Approach:       North Bound      South Bound       East Bound       West Bound
Movement:      L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Permitted        Permitted       Prot+Permit        Permitted
Rights:           Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Y+R:          4.0  4.0   4.0   4.0  4.0   4.0   4.0  4.0   4.0   4.0  4.0   4.0
Lanes:         1  0  0  1  0    1  0  1  0  1    1  0  1  0  1    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:     615  337    22    29  114    96   237  318    22    12  125    15
Growth Adj:  1.17 1.17  1.17  1.17 1.17  1.17  1.17 1.17  1.17  1.17 1.17  1.17
Initial Bse:  718  394    26    34  133   112   277  371    26    14  146    18
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:   756  414    27    36  140   118   291  391    27    15  154    18
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  756  414    27    36  140   118   291  391    27    15  154    18
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  756  414    27    36  140   118   291  391    27    15  154    18
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.66 0.99  0.99  0.44 1.00  0.85  0.95 1.00  0.85  0.95 1.00  0.85
Lanes:       1.00 0.94  0.06  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Final Sat.:  1246 1768   115   836 1900  1615  1805 1900  1615  1805 1900  1615
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.61 0.23  0.23  0.04 0.07  0.07  0.16 0.21  0.02  0.01 0.08  0.01
Crit Moves:  ****                              ****                   ****
Green/Cycle: 0.67 0.67  0.67  0.67 0.67  0.67  0.26 0.26  0.26  0.01 0.09  0.09
Volume/Cap:  0.91 0.35  0.35  0.06 0.11  0.11  0.65 0.80  0.07  0.80 0.91  0.13
Delay/Veh:   22.3  4.5   4.5   3.5  3.6   3.6  23.2 30.2  16.9 147.2 71.1  25.6
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  22.3  4.5   4.5   3.5  3.6   3.6  23.2 30.2  16.9 147.2 71.1  25.6
LOS by Move:    C    A     A     A    A     A     C    C     B     F    E     C
HCM2kAvgQ:     17    4     4     0    1     1     6    9     0     1    6     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

```
--------------------------------------------------------------------------------
                               Existing Volumes
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
           2000 HCM Unsignalized Method (Future Volume Alternative)
********************************************************************************
Intersection #9 4th Ave East/Ave M
********************************************************************************
Average Delay (sec/veh):      2.9       Worst Case Level Of Service: C[ 19.5]
********************************************************************************
Approach:       North Bound      South Bound       East Bound        West Bound
Movement:      L  -  T  -  R   L  -  T  -  R   L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign        Stop Sign       Uncontrolled      Uncontrolled
Rights:           Include          Include          Include           Include
Lanes:         0  0  0  0  0   0  0  1! 0  0   1  0  2  0  0    0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:        0    0     0     6    0   101   252  587     0     0  835    76
Growth Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:     0    0     0     6    0   101   252  587     0     0  835    76
Added Vol:       0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:     0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:     0    0     0     6    0   101   252  587     0     0  835    76
User Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:      0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:      0    0     0     6    0   106   265  618     0     0  879    80
Reduct Vol:      0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:     0    0     0     6    0   106   265  618     0     0  879    80
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.8  6.5   6.9   4.2 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5  4.0   3.3   2.3 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx  1758 2067   479   959 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx    78   55   538   695 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx    54   34   538   695 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.12 0.00  0.20  0.38 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   1.8 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx  13.3 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:     *    *     *     *    *     *     B    *     *     *    *     *
Movement:      LT - LTR - RT   LT - LTR - RT   LT - LTR - RT    LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx  359 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx  1.3 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx 19.5 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:      *    *     *     *    C     *     *    *     *     *    *     *
ApproachDel:    xxxxxx              19.5            xxxxxx            xxxxxx
ApproachLOS:          *               C                *                 *
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
```

```
--------------------------------------------------------------------------------
                                Existing Volumes
--------------------------------------------------------------------------------
                        Level Of Service Computation Report
               2000 HCM Unsignalized Method (Future Volume Alternative)
********************************************************************************
Intersection #9 4th Ave East/Ave M
********************************************************************************
Average Delay (sec/veh):       3.4       Worst Case Level Of Service: D[ 27.5]
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:          Include          Include          Include          Include
Lanes:        0  0  0  0  0   0  0  1! 0  0   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0    0     0    20    0   165   132  759     0     0  847    25
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0    0     0    20    0   165   132  759     0     0  847    25
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0    0     0    20    0   165   132  759     0     0  847    25
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0    0     0    21    0   174   139  799     0     0  892    26
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:    0    0     0    21    0   174   139  799     0     0  892    26
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.8  6.5   6.9   4.2 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5  4.0   3.3   2.3 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx  1582 1982   459   918 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx   101   62   555   721 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx    86   50   555   721 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.24 0.00  0.31  0.19 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   0.7 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx  11.2 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:    *    *     *     *    *     *     B    *     *     *    *     *
Movement:     LT - LTR - RT   LT - LTR - RT   LT - LTR - RT   LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx  350 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx  3.2 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx 27.5 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:     *    *     *     *    D     *     *    *     *     *    *     *
ApproachDel:     xxxxxx            27.5             xxxxxx           xxxxxx
ApproachLOS:        *                D                 *                *
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
```

```
MITIG8 - AM Peak Hour      Wed Mar 10, 2010 21:28:14            Page 1-1
------------------------------------------------------------------------------
                          Year 2011 Base Case
------------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Unsignalized Method (Future Volume Alternative)
******************************************************************************
Intersection #9 4th Ave East/Ave M
******************************************************************************
Average Delay (sec/veh):       3.0      Worst Case Level Of Service: C[ 21.1]
******************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:          Include          Include          Include          Include
Lanes:        0  0  0  0  0   0  0  1! 0  0   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0    0     0     6    0   101   252  620     0     0  882    76
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0    0     0     6    0   101   252  620     0     0  882    76
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0    0     0     6    0   101   252  620     0     0  882    76
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0    0     0     6    0   106   265  653     0     0  928    80
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:    0    0     0     6    0   106   265  653     0     0  928    80
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.8  6.5   6.9   4.2 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5  4.0   3.3   2.3 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx  1825 2152   504  1008 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx    70   49   518   665 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx    48   29   518   665 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.13 0.00  0.21  0.40 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   1.9 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx  14.0 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:    *    *     *     *    *     *     B    *     *     *    *     *
Movement:     LT - LTR - RT   LT - LTR - RT   LT - LTR - RT   LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx  335 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx  1.4 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx 21.1 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:     *    *     *     *    C     *     *    *     *     *    *     *
ApproachDel:     xxxxxx              21.1             xxxxxx           xxxxxx
ApproachLOS:          *                 C                *                *
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
```

```
MITIG8 - PM Peak Hour      Wed Mar 10, 2010 21:31:02                   Page 1-1
--------------------------------------------------------------------------------
                              2011 Base Case
--------------------------------------------------------------------------------
                     Level Of Service Computation Report
          2000 HCM Unsignalized Method (Future Volume Alternative)
********************************************************************************
Intersection #9 4th Ave East/Ave M
********************************************************************************
Average Delay (sec/veh):       3.6       Worst Case Level Of Service: D[ 31.4]
********************************************************************************
Approach:     North Bound      South Bound       East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:          Include          Include          Include          Include
Lanes:       0  0  0  0  0    0  0  1! 0  0    1  0  2  0  0    0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0    0     0    20    0   165   132  802     0     0  895    25
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0    0     0    20    0   165   132  802     0     0  895    25
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
PasserByVol:    0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:    0    0     0    20    0   165   132  802     0     0  895    25
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0    0     0    21    0   174   139  844     0     0  942    26
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:    0    0     0    21    0   174   139  844     0     0  942    26
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.8  6.5   6.9   4.2 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5  4.0   3.3   2.3 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx  1655 2077   484   968 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx    91   54   534   689 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx    77   43   534   689 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.27 0.00  0.33  0.20 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   0.7 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx  11.5 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:    *    *     *     *    *     *     B    *     *     *    *     *
Movement:     LT - LTR - RT    LT - LTR - RT    LT - LTR - RT    LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx  325 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx  3.7 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx 31.4 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:     *    *     *     *    D     *     *    *     *     *    *     *
ApproachDel:     xxxxxx             31.4            xxxxxx           xxxxxx
ApproachLOS:        *                 D                *                *
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
```

Existing Volumes

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #10 10th Ave West/Ave L

Cycle (sec):	60	Critical Vol./Cap.(X):	0.415
Loss Time (sec):	12	Average Delay (sec/veh):	18.3
Optimal Cycle:	42	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3	0 1	2 0	2	0 1	2 0	3	0 1	2 0	2	1 0
Volume Module:												
Base Vol:	84	307	69	93	340	115	145	746	222	115	644	75
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	84	307	69	93	340	115	145	746	222	115	644	75
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	84	307	69	93	340	115	145	746	222	115	644	75
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	88	323	73	98	358	121	153	785	234	121	678	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	88	323	73	98	358	121	153	785	234	121	678	79
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	88	323	73	98	358	121	153	785	234	121	678	79
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.88	0.87	0.81	0.88	0.90	0.81	0.88	0.87	0.81	0.88	0.85	0.85
Lanes:	2.00	3.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00	2.00	2.69	0.31
Final Sat.:	3334	4938	1537	3334	3437	1537	3334	4938	1537	3334	4352	507
Capacity Analysis Module:												
Vol/Sat:	0.03	0.07	0.05	0.03	0.10	0.08	0.05	0.16	0.15	0.04	0.16	0.16
Crit Moves:	****				****		****				****	
Green/Cycle:	0.08	0.22	0.22	0.11	0.24	0.24	0.11	0.32	0.32	0.16	0.37	0.37
Volume/Cap:	0.32	0.30	0.22	0.27	0.43	0.32	0.43	0.50	0.48	0.23	0.43	0.43
Delay/Veh:	26.6	19.8	19.6	24.9	19.5	19.1	25.9	17.0	17.4	22.3	14.5	14.5
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	26.6	19.8	19.6	24.9	19.5	19.1	25.9	17.0	17.4	22.3	14.5	14.5
LOS by Move:	C	B	B	C	B	B	C	B	B	C	B	B
HCM2kAvgQ:	1	2	1	1	3	2	2	5	4	1	4	4

Note: Queue reported is the number of cars per lane.

Existing Volumes

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #10 10th Ave West/Ave L

Cycle (sec):	90	Critical Vol./Cap.(X):	0.807
Loss Time (sec):	12	Average Delay (sec/veh):	31.7
Optimal Cycle:	76	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	2 0	1	2 0	3 0	1	2 0	2 1	0
Volume Module:												
Base Vol:	311	516	164	167	509	396	242	755	179	114	1045	126
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	311	516	164	167	509	396	242	755	179	114	1045	126
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	311	516	164	167	509	396	242	755	179	114	1045	126
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	327	543	173	176	536	417	255	795	188	120	1100	133
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	327	543	173	176	536	417	255	795	188	120	1100	133
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	327	543	173	176	536	417	255	795	188	120	1100	133
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.88	0.87	0.81	0.88	0.90	0.81	0.88	0.87	0.81	0.88	0.85	0.85
Lanes:	2.00	3.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00	2.00	2.68	0.32
Final Sat.:	3334	4938	1537	3334	3437	1537	3334	4938	1537	3334	4336	523
Capacity Analysis Module:												
Vol/Sat:	0.10	0.11	0.11	0.05	0.16	0.27	0.08	0.16	0.12	0.04	0.25	0.25
Crit Moves:	****					****	****				****	
Green/Cycle:	0.12	0.31	0.31	0.15	0.34	0.34	0.09	0.30	0.30	0.10	0.31	0.31
Volume/Cap:	0.81	0.36	0.37	0.35	0.46	0.81	0.81	0.53	0.40	0.34	0.81	0.81
Delay/Veh:	49.8	24.5	24.9	34.6	23.8	36.3	54.1	26.3	25.4	38.0	31.6	31.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	49.8	24.5	24.9	34.6	23.8	36.3	54.1	26.3	25.4	38.0	31.6	31.6
LOS by Move:	D	C	C	C	C	D	D	C	C	D	C	C
HCM2kAvgQ:	7	4	4	3	6	13	6	7	4	2	14	14

Note: Queue reported is the number of cars per lane.

Year 2011 Base Case

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #10 10th Ave West/Ave L

Cycle (sec):	60	Critical Vol./Cap.(X):	0.425
Loss Time (sec):	12	Average Delay (sec/veh):	18.5
Optimal Cycle:	43	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	6	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	2 0	1	2 0	3 0	1	2 0	2 1	0
Volume Module:												
Base Vol:	84	307	69	93	340	115	145	788	222	115	680	75
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	84	307	69	93	340	115	145	788	222	115	680	75
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	84	307	69	93	340	115	145	788	222	115	680	75
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	88	323	73	98	358	121	153	829	234	121	716	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	88	323	73	98	358	121	153	829	234	121	716	79
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	88	323	73	98	358	121	153	829	234	121	716	79
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.88	0.87	0.81	0.88	0.90	0.81	0.88	0.87	0.81	0.88	0.85	0.85
Lanes:	2.00	3.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00	2.00	2.70	0.30
Final Sat.:	3334	4938	1537	3334	3437	1537	3334	4938	1537	3334	4381	483
Capacity Analysis Module:												
Vol/Sat:	0.03	0.07	0.05	0.03	0.10	0.08	0.05	0.17	0.15	0.04	0.16	0.16
Crit Moves:	****				****		****				****	
Green/Cycle:	0.10	0.22	0.22	0.11	0.23	0.23	0.10	0.31	0.31	0.15	0.37	0.37
Volume/Cap:	0.27	0.30	0.21	0.26	0.45	0.34	0.45	0.54	0.49	0.23	0.45	0.45
Delay/Veh:	25.4	19.6	19.4	24.8	20.1	19.7	26.3	17.4	17.5	22.5	14.6	14.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	25.4	19.6	19.4	24.8	20.1	19.7	26.3	17.4	17.5	22.5	14.6	14.6
LOS by Move:	C	B	B	C	C	B	C	B	B	C	B	B
HCM2kAvgQ:	1	2	1	1	3	2	2	5	4	1	4	4

Note: Queue reported is the number of cars per lane.

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--------------------------------------------------------------------------------
                                2011 Base Case
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                      Level Of Service Computation Report
             2000 HCM Operations Method (Future Volume Alternative)
********************************************************************************
Intersection #10 10th Ave West/Ave L
********************************************************************************
Cycle (sec):           90                Critical Vol./Cap.(X):          0.821
Loss Time (sec):       12                Average Delay (sec/veh):         32.0
Optimal Cycle:         79                Level Of Service:                   C
********************************************************************************
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected        Protected
Rights:           Include          Include          Include          Include
Min. Green:     5   10    5     5   10    5     5   10    5     5   10    5
Y+R:          4.0  4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0
Lanes:        2  0  3  0  1   2  0  2  0  1   2  0  3  0  1   2  0  2  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:     311  516  164   167  509  396   242  798  179   114 1104  126
Growth Adj:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:  311  516  164   167  509  396   242  798  179   114 1104  126
Added Vol:      0    0    0     0    0    0     0    0    0     0    0    0
PasserByVol:    0    0    0     0    0    0     0    0    0     0    0    0
Initial Fut:  311  516  164   167  509  396   242  798  179   114 1104  126
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95
PHF Volume:   327  543  173   176  536  417   255  840  188   120 1162  133
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:  327  543  173   176  536  417   255  840  188   120 1162  133
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:  327  543  173   176  536  417   255  840  188   120 1162  133
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  0.88 0.87 0.81  0.88 0.90 0.81  0.88 0.87 0.81  0.88 0.85 0.85
Lanes:       2.00 3.00 1.00  2.00 2.00 1.00  2.00 3.00 1.00  2.00 2.69 0.31
Final Sat.:  3334 4938 1537  3334 3437 1537  3334 4938 1537  3334 4366  498
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.10 0.11 0.11  0.05 0.16 0.27  0.08 0.17 0.12  0.04 0.27 0.27
Crit Moves:  ****                       ****  ****                  ****
Green/Cycle: 0.12 0.30 0.30  0.15 0.33 0.33  0.09 0.31 0.31  0.10 0.32 0.32
Volume/Cap:  0.82 0.37 0.37  0.35 0.47 0.82  0.82 0.54 0.39  0.35 0.82 0.82
Delay/Veh:   51.5 24.9 25.3  34.9 24.2 38.0  56.0 25.9 24.6  38.2 31.6 31.6
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:  51.5 24.9 25.3  34.9 24.2 38.0  56.0 25.9 24.6  38.2 31.6 31.6
LOS by Move:    D    C    C     C    C    D     E    C    C     D    C    C
HCM2kAvgQ:      7    4    4     3    6   13     6    7    4     2   15   15
********************************************************************************
Note: Queue reported is the number of cars per lane.
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Year 2011 Base Case + Project

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

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Intersection #10 10th Ave West/Ave L

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Cycle (sec):	75	Critical Vol./Cap.(X):	0.518
Loss Time (sec):	12	Average Delay (sec/veh):	19.4
Optimal Cycle:	43	Level Of Service:	B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	6	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	2 0	1	2 0	3 0	1	2 0	2 1	0
Volume Module:												
Base Vol:	84	307	69	93	340	115	145	1257	222	115	680	75
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	84	307	69	93	340	115	145	1257	222	115	680	75
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	84	307	69	93	340	115	145	1257	222	115	680	75
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	88	323	73	98	358	121	153	1323	234	121	716	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	88	323	73	98	358	121	153	1323	234	121	716	79
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	88	323	73	98	358	121	153	1323	234	121	716	79
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.88	0.87	0.81	0.88	0.90	0.81	0.88	0.87	0.81	0.88	0.85	0.85
Lanes:	2.00	3.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00	2.00	2.70	0.30
Final Sat.:	3334	4938	1537	3334	3437	1537	3334	4938	1537	3334	4381	483
Capacity Analysis Module:												
Vol/Sat:	0.03	0.07	0.05	0.03	0.10	0.08	0.05	0.27	0.15	0.04	0.16	0.16
Crit Moves:	****				****			****		****		
Green/Cycle:	0.08	0.18	0.18	0.09	0.19	0.19	0.16	0.50	0.50	0.07	0.40	0.40
Volume/Cap:	0.33	0.36	0.26	0.32	0.54	0.41	0.28	0.54	0.30	0.54	0.41	0.41
Delay/Veh:	33.3	27.1	26.8	32.5	28.1	27.4	27.7	13.1	11.3	36.4	16.2	16.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	33.3	27.1	26.8	32.5	28.1	27.4	27.7	13.1	11.3	36.4	16.2	16.2
LOS by Move:	C	C	C	C	C	C	C	B	B	D	B	B
HCM2kAvgQ:	1	3	2	1	5	3	2	8	3	2	5	5

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Note: Queue reported is the number of cars per lane.

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2011 Base Case + Project

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #10 10th Ave West/Ave L

Cycle (sec):	90	Critical Vol./Cap.(X):	0.944
Loss Time (sec):	12	Average Delay (sec/veh):	38.0
Optimal Cycle:	125	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	5	5	5	5	5	5	5	5	5	5	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	2 0	1	2 0	3 0	1	2 0	2 1	0
Volume Module:												
Base Vol:	311	516	164	167	509	396	242	798	179	114	1602	126
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	311	516	164	167	509	396	242	798	179	114	1602	126
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	311	516	164	167	509	396	242	798	179	114	1602	126
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	327	543	173	176	536	417	255	840	188	120	1686	133
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	327	543	173	176	536	417	255	840	188	120	1686	133
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	327	543	173	176	536	417	255	840	188	120	1686	133
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.88	0.87	0.81	0.88	0.90	0.81	0.88	0.87	0.81	0.88	0.86	0.86
Lanes:	2.00	3.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00	2.00	2.78	0.22
Final Sat.:	3334	4938	1537	3334	3437	1537	3334	4938	1537	3334	4528	356
Capacity Analysis Module:												
Vol/Sat:	0.10	0.11	0.11	0.05	0.16	0.27	0.08	0.17	0.12	0.04	0.37	0.37
Crit Moves:	****					****	****				****	
Green/Cycle:	0.10	0.26	0.26	0.13	0.29	0.29	0.08	0.36	0.36	0.12	0.39	0.39
Volume/Cap:	0.94	0.42	0.43	0.41	0.54	0.94	0.94	0.47	0.34	0.31	0.94	0.94
Delay/Veh:	74.0	27.8	28.4	36.6	27.7	60.4	80.9	22.5	21.5	36.8	36.5	36.5
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	74.0	27.8	28.4	36.6	27.7	60.4	80.9	22.5	21.5	36.8	36.5	36.5
LOS by Move:	E	C	C	D	C	E	F	C	C	D	D	D
HCM2kAvgQ:	8	5	4	3	7	16	7	7	4	2	23	23

Note: Queue reported is the number of cars per lane.

Existing Volumes

Level Of Service Computation Report

2000 HCM Operations Method (Future Volume Alternative)

Intersection #11 Business Ctr Pkwy/Ave L

Cycle (sec):	50	Critical Vol./Cap.(X):	0.494
Loss Time (sec):	9	Average Delay (sec/veh):	14.5
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0 2 0 1			1 0 1 0 1			2 0 1 0 1			1 0 2 0 1		
Volume Module:												
Base Vol:	32	281	11	22	105	269	561	335	59	18	516	54
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	32	281	11	22	105	269	561	335	59	18	516	54
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	32	281	11	22	105	269	561	335	59	18	516	54
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.00	0.95	0.95	0.00	0.95	0.95	0.95	0.95	0.95	0.00
PHF Volume:	34	296	0	23	111	0	591	353	62	19	543	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	296	0	23	111	0	591	353	62	19	543	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
FinalVolume:	34	296	0	23	111	0	591	353	62	19	543	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.65	0.90	1.00	0.51	0.95	1.00	0.92	1.00	0.85	0.95	0.95	1.00
Lanes:	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
Final Sat.:	1226	3437	1900	977	1809	1900	3502	1900	1615	1805	3610	1900
Capacity Analysis Module:												
Vol/Sat:	0.03	0.09	0.00	0.02	0.06	0.00	0.17	0.19	0.04	0.01	0.15	0.00
Crit Moves:		****					****				****	
Green/Cycle:	0.20	0.20	0.00	0.20	0.20	0.00	0.33	0.41	0.41	0.21	0.29	0.00
Volume/Cap:	0.14	0.43	0.00	0.12	0.31	0.00	0.51	0.45	0.09	0.05	0.51	0.00
Delay/Veh:	16.7	17.9	0.0	16.7	17.5	0.0	14.0	11.0	9.0	16.0	15.2	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	16.7	17.9	0.0	16.7	17.5	0.0	14.0	11.0	9.0	16.0	15.2	0.0
LOS by Move:	B	B	A	B	B	A	B	B	A	B	B	A
HCM2kAvgQ:	1	3	0	0	2	0	4	4	1	0	4	0

Note: Queue reported is the number of cars per lane.

Existing Volumes

Level Of Service Computation Report

2000 HCM Operations Method (Future Volume Alternative)

Intersection #11 Business Ctr Pkwy/Ave L

Cycle (sec):	50	Critical Vol./Cap.(X):	0.559
Loss Time (sec):	9	Average Delay (sec/veh):	13.5
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	1 0	1	2 0	1 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	56	164	24	98	152	697	286	642	25	25	550	24
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	56	164	24	98	152	697	286	642	25	25	550	24
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	56	164	24	98	152	697	286	642	25	25	550	24
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.00	0.95	0.95	0.00	0.95	0.95	0.95	0.95	0.95	0.00
PHF Volume:	59	173	0	103	160	0	301	676	26	26	579	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	59	173	0	103	160	0	301	676	26	26	579	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
FinalVolume:	59	173	0	103	160	0	301	676	26	26	579	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.54	0.90	1.00	0.61	0.95	1.00	0.92	1.00	0.85	0.95	0.95	1.00
Lanes:	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
Final Sat.:	1035	3437	1900	1159	1809	1900	3502	1900	1615	1805	3610	1900
Capacity Analysis Module:												
Vol/Sat:	0.06	0.05	0.00	0.09	0.09	0.00	0.09	0.36	0.02	0.01	0.16	0.00
Crit Moves:					****			****		****		
Green/Cycle:	0.20	0.20	0.00	0.20	0.20	0.00	0.21	0.52	0.52	0.10	0.41	0.00
Volume/Cap:	0.28	0.25	0.00	0.44	0.44	0.00	0.42	0.68	0.03	0.15	0.39	0.00
Delay/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	17.6	10.9	5.9	20.9	10.4	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	17.6	10.9	5.9	20.9	10.4	0.0
LOS by Move:	B	B	A	B	B	A	B	B	A	C	B	A
HCM2kAvgQ:	1	1	0	2	3	0	3	9	0	1	4	0

Note: Queue reported is the number of cars per lane.

Year 2011 Base Case

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #11 Business Ctr Pkwy/Ave L

Cycle (sec):	50	Critical Vol./Cap.(X):	0.504
Loss Time (sec):	9	Average Delay (sec/veh):	14.6
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound	South Bound	East Bound	West Bound
Control:	Permitted	Permitted	Protected	Protected
Rights:	Ignore	Ignore	Include	Ignore
Lanes:	1 0 2 0 1	1 0 1 0 1	2 0 1 0 1	1 0 2 0 1

Movement:	NB L	NB T	NB R	SB L	SB T	SB R	EB L	EB T	EB R	WB L	WB T	WB R
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Volume Module:												
Base Vol:	32	281	11	22	105	269	561	354	59	18	545	54
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	32	281	11	22	105	269	561	354	59	18	545	54
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	32	281	11	22	105	269	561	354	59	18	545	54
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.00	0.95	0.95	0.00	0.95	0.95	0.95	0.95	0.95	0.00
PHF Volume:	34	296	0	23	111	0	591	373	62	19	574	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	296	0	23	111	0	591	373	62	19	574	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
FinalVolume:	34	296	0	23	111	0	591	373	62	19	574	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.65	0.90	1.00	0.51	0.95	1.00	0.92	1.00	0.85	0.95	0.95	1.00
Lanes:	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
Final Sat.:	1226	3437	1900	977	1809	1900	3502	1900	1615	1805	3610	1900
Capacity Analysis Module:												
Vol/Sat:	0.03	0.09	0.00	0.02	0.06	0.00	0.17	0.20	0.04	0.01	0.16	0.00
Crit Moves:		****					****				****	
Green/Cycle:	0.20	0.20	0.00	0.20	0.20	0.00	0.32	0.41	0.41	0.21	0.30	0.00
Volume/Cap:	0.14	0.43	0.00	0.12	0.31	0.00	0.53	0.47	0.09	0.05	0.53	0.00
Delay/Veh:	16.7	17.9	0.0	16.7	17.5	0.0	14.4	11.2	9.0	16.0	15.0	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	16.7	17.9	0.0	16.7	17.5	0.0	14.4	11.2	9.0	16.0	15.0	0.0
LOS by Move:	B	B	A	B	B	A	B	B	A	B	B	A
HCM2kAvgQ:	1	3	0	0	2	0	5	5	1	0	5	0

Note: Queue reported is the number of cars per lane.

2011 Base Case

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #11 Business Ctr Pkwy/Ave L

Cycle (sec):	50	Critical Vol./Cap.(X):	0.584
Loss Time (sec):	9	Average Delay (sec/veh):	13.7
Optimal Cycle:	36	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	1 0	1	2 0	1 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	56	164	24	98	152	697	286	678	25	25	581	24
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	56	164	24	98	152	697	286	678	25	25	581	24
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	56	164	24	98	152	697	286	678	25	25	581	24
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.00	0.95	0.95	0.00	0.95	0.95	0.95	0.95	0.95	0.00
PHF Volume:	59	173	0	103	160	0	301	714	26	26	612	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	59	173	0	103	160	0	301	714	26	26	612	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
FinalVolume:	59	173	0	103	160	0	301	714	26	26	612	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.54	0.90	1.00	0.61	0.95	1.00	0.92	1.00	0.85	0.95	0.95	1.00
Lanes:	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
Final Sat.:	1035	3437	1900	1159	1809	1900	3502	1900	1615	1805	3610	1900
Capacity Analysis Module:												
Vol/Sat:	0.06	0.05	0.00	0.09	0.09	0.00	0.09	0.38	0.02	0.01	0.17	0.00
Crit Moves:					****			****		****		
Green/Cycle:	0.20	0.20	0.00	0.20	0.20	0.00	0.21	0.52	0.52	0.10	0.41	0.00
Volume/Cap:	0.28	0.25	0.00	0.44	0.44	0.00	0.42	0.72	0.03	0.15	0.41	0.00
Delay/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	17.6	11.9	5.9	20.9	10.5	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	17.6	11.9	5.9	20.9	10.5	0.0
LOS by Move:	B	B	A	B	B	A	B	B	A	C	B	A
HCM2kAvgQ:	1	1	0	2	3	0	3	10	0	1	4	0

Note: Queue reported is the number of cars per lane.

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MITIG8 - AM Peak Hour      Wed Mar 10, 2010 21:34:23                 Page 1-1
-------------------------------------------------------------------------------
                         Year 2011 Base Case + Project
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
            2000 HCM Operations Method (Future Volume Alternative)
*******************************************************************************
Intersection #11 Business Ctr Pkwy/Ave L
*******************************************************************************
Cycle (sec):          50               Critical Vol./Cap.(X):         0.746
Loss Time (sec):       9               Average Delay (sec/veh):        23.7
Optimal Cycle:        48               Level Of Service:                  C
*******************************************************************************
Approach:      North Bound      South Bound       East Bound        West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected         Protected
Rights:           Ignore           Ignore          Include           Ignore
Min. Green:    5   10     5    5   10     5    5   10     5    5   10     5
Y+R:         4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0   4.0  4.0  4.0   4.0
Lanes:        1  0  2  0  1   1  0  1  0  1   2  0  1  0  1   1  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:      32  281    11   22  105   269  561  930    59   18  545    54
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:   32  281    11   22  105   269  561  930    59   18  545    54
Added Vol:      0    0     0    0    0     0    0    0     0    0    0     0
PasserByVol:    0    0     0    0    0     0    0    0     0    0    0     0
Initial Fut:   32  281    11   22  105   269  561  930    59   18  545    54
User Adj:    1.00 1.00  0.00 1.00 1.00  0.00 1.00 1.00  1.00 1.00 1.00  0.00
PHF Adj:     0.95 0.95  0.00 0.95 0.95  0.00 0.95 0.95  0.95 0.95 0.95  0.00
PHF Volume:    34  296     0   23  111     0  591  979    62   19  574     0
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   34  296     0   23  111     0  591  979    62   19  574     0
PCE Adj:     1.00 1.00  0.00 1.00 1.00  0.00 1.00 1.00  1.00 1.00 1.00  0.00
MLF Adj:     1.00 1.00  0.00 1.00 1.00  0.00 1.00 1.00  1.00 1.00 1.00  0.00
FinalVolume:   34  296     0   23  111     0  591  979    62   19  574     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  0.65 0.90  1.00 0.51 0.95  1.00 0.92 1.00  0.85 0.95 0.95  1.00
Lanes:       1.00 2.00  1.00 1.00 1.00  1.00 2.00 1.00  1.00 1.00 2.00  1.00
Final Sat.:  1226 3437  1900  977 1809  1900 3502 1900  1615 1805 3610  1900
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.03 0.09  0.00 0.02 0.06  0.00 0.17 0.52  0.04 0.01 0.16  0.00
Crit Moves:       ****                           ****         ****
Green/Cycle: 0.20 0.20  0.00 0.20 0.20  0.00 0.28 0.52  0.52 0.10 0.34  0.00
Volume/Cap:  0.14 0.43  0.00 0.12 0.31  0.00 0.59 0.99  0.07 0.10 0.47  0.00
Delay/Veh:   16.7 17.9   0.0 16.7 17.5   0.0 16.4 38.2   6.0 20.7 13.4   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:  16.7 17.9   0.0 16.7 17.5   0.0 16.4 38.2   6.0 20.7 13.4   0.0
LOS by Move:    B    B     A    B    B     A    B    D     A    C    B     A
HCM2kAvgQ:      1    3     0    0    2     0    5   24     1    0    4     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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MITIG8 - PM Peak Hour   Wed Mar 10, 2010 21:36:24   Page 1-1

2011 Base Case + Project

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #11 Business Ctr Pkwy/Ave L

Cycle (sec):	50	Critical Vol./Cap.(X):	0.584
Loss Time (sec):	9	Average Delay (sec/veh):	14.0
Optimal Cycle:	36	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	5	10	5	5	10	5	5	10	5	5	10	5
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0 2 0 1			1 0 1 0 1			2 0 1 0 1			1 0 2 0 1		
Volume Module:												
Base Vol:	56	164	24	98	152	697	286	678	25	25	1157	24
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	56	164	24	98	152	697	286	678	25	25	1157	24
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	56	164	24	98	152	697	286	678	25	25	1157	24
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.00	0.95	0.95	0.00	0.95	0.95	0.95	0.95	0.95	0.00
PHF Volume:	59	173	0	103	160	0	301	714	26	26	1218	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	59	173	0	103	160	0	301	714	26	26	1218	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
FinalVolume:	59	173	0	103	160	0	301	714	26	26	1218	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.54	0.90	1.00	0.61	0.95	1.00	0.92	1.00	0.85	0.95	0.95	1.00
Lanes:	1.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00
Final Sat.:	1035	3437	1900	1159	1809	1900	3502	1900	1615	1805	3610	1900
Capacity Analysis Module:												
Vol/Sat:	0.06	0.05	0.00	0.09	0.09	0.00	0.09	0.38	0.02	0.01	0.34	0.00
Crit Moves:					****			****		****		
Green/Cycle:	0.20	0.20	0.00	0.20	0.20	0.00	0.14	0.52	0.52	0.10	0.48	0.00
Volume/Cap:	0.28	0.25	0.00	0.44	0.44	0.00	0.61	0.72	0.03	0.15	0.71	0.00
Delay/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	22.3	11.9	5.9	20.9	11.6	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	17.7	17.0	0.0	18.9	18.4	0.0	22.3	11.9	5.9	20.9	11.6	0.0
LOS by Move:	B	B	A	B	B	A	C	B	A	C	B	A
HCM2kAvgQ:	1	1	0	2	3	0	3	10	0	1	9	0

Note: Queue reported is the number of cars per lane.

VISUAL RESOURCES

Attachment VR-1

PHPP Cooling Tower Simulation

Figure 5.15-5a

View from KOP-2 Looking East Toward PHPP Site – Existing Condition

Figure 5.15-5c

View from KOP-2 Looking East Toward PHPP Site – Simulated Condition

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

APPLICATION FOR CERTIFICATION for the *PALMDALE HYBRID POWER PROJECT*

Docket No. 08-AFC-9

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(Revised 3/2/2010)

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DECLARATION OF SERVICE

I, Sara J. Head, declare that on, March 20, 2010, I served and filed copies of the attached **CITY OF PALMDALE'S SUPPLEMENTAL COMMENTS ON VOLUMES 1 AND 2 OF THE PRELIMINARY STAFF ASSESSMENT FOR THE PALMDALE HYBRID POWER PROJECT**. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/palmdale/index.html]**.

The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(C*heck all that Apply*)

For service to all other parties:

__X__ an electronic (CD) file sent to all addresses on the Proof of Service list;

__X__ by depositing in the United States mail at Camarillo, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

_X__ sending an original paper copy and one electronic (CD) copy, mailed to the address below (preferred method);

OR

___ depositing in the mail an original and 12 paper copies as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-9
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Sara J. Head