

BUTTE REGIONAL TRANSIT OPERATIONS CENTER ON-SITE PACKAGE

**BUTTE COUNTY ASSOCIATION OF
GOVERNMENTS**

ADDENDUM NO. 2

PROJECT ADDRESS
**326 Huss Lane
Chico, Ca. 95928**

OWNER
**Butte County Association of
Governments
2580 Sierra Sunrise Terrace,
Suite 100
Chico, Ca. 95928**

DATE
08/01/14

TLCD PROJECT NUMBER
11054.00

Note: The following changes, modifications and additions to the Project Manual and Drawings described within this Addendum are made a part thereof and are subject to all of the requirements thereof as if originally specified.

ADDENDUM NO. 2

**BUTTE REGIONAL TRANSIT OPERATIONS
CENTER
ON-SITE PACKAGE**

**Butte County Association of Governments
2850 Sierra Sunrise Terrace, Suite 100
Chico, Ca. 95928**

STAMPS, SIGNATURES AND APPROVALS

ADDENDUM NO. 2

To the Plans and Specifications for:

BUTTE REGIONAL TRANSIT OPERATIONS CENTER ON-SITE PACKAGE

Butte County Association of Governments
2850 Sierra Sunrise Terrace, Suite 100
Chico, Ca. 95928

Date: 8-1-14

GENERAL INFORMATION FOR BIDDERS

- Question at pre-bid meeting: "Will water and power be provided to contractor for on-site activities during construction?"
 - **Answer:** "no power or water is available from the existing building for the contractor's use. Contractor's will have to contact PG&E or the city water district for all temp power or water supply. Also note that Sierra Nevada Brewing (SNB) does not have any water sources available to the contractor's either."
- Pre-Bid Meeting Sign-In sheet attached
- Contractor question pertaining to information discussed in the pre-bid meeting (related to labor compliance). Question: "Does the Awarding Body have an in-house Labor Compliance Program or contract with a third-party Labor Compliance Program?"
 - **Answer:** "This was addressed to the bidders at the Pre-Bid conference and in the bid documents at section 00 72 13 – General Conditions, Article 26 starting on pg 67 of the GC's. We provided an overview of the requirements and that Kitchell will be reviewing the documents to be provided to the Owner every 2 weeks. The documents are to be provided as pdf's every 2 weeks to the e-mail address provided. Kitchell will work with the GC's HR or labor compliance staff closely to ensure the project requirements are being met. All labor compliance documents are to be provided as pdf files to the e-mail provided, no other software is required. Please review the General Conditions closely."
- Bidder Question: "What is the funding source for this project?"
 - **Answer:**
Federal Transit Administration – 5307 and 5309
Public Transportation Modernization, Improvement, and Service Enhancement Account Program (PTMISEA)
Department of the Treasury - New Market Tax Credits – Private Investment
State Transportation Improvement Program
Cal OES
Cal Recycle

- Pre-Bid Meeting presentation slide (related to Labor Compliance) attached
- Question related to Section 31 0000 Earthwork: "Please clarify there is no anticipated contaminated soils on the project and we are not to include item 3.18.D "contractor to hire California-certified laboratory to sample and test the potentially contaminated soil".
 - **Answer:** "There were no "contaminated soils" disclosed by the Phase I/II survey's for the site; Limited Environmental Site Investigation, Phase II Environmental Site Investigation and Initial Site Assessment. The section cited above, Para 3.18 describes the actions to be taken by the contractor if/when contaminated materials are discovered in the course of construction. The steps and actions described in this section would be followed at that time, and any unforeseen conditions addressed appropriately. The site was a former agricultural use."
- Bidder Question: "On the bid documents – how detailed do they need to be at bid time - Can we list address as City & State and can license number follow within 24 hours."
 - **Answer:** "Yes, that's fine".
- Bidder Question: "The City of Chico informed us today they are unable to offer what the value of the Encroachment Fees will be for the project. We are requesting the Encroachment Fees be carried by the Owner or an allowance be issued to be included by the general contractors."
 - **Answer:** "Owner will carry encroachment permit cost. Contractor to procure, Owner to reimburse direct cost of permit only."
- Awarded Contractor to have available, in jobsite trailer, all addendum specification sections printed on colored paper or otherwise clearly distinguishable from non-addendum sections. It is the responsibility of the Contractor to supply all applicable sub-contractors with the latest specification sections.

REVISIONS TO SPECIFICATIONS

1.1 REVISION TO TABLE OF CONTENTS:

- A. Revise Section 00 3100 Preliminary Construction Schedule to read: "00 3113 Construction Durations, Phasing and Milestones.
- B. Add Civil Appendix Item A to read: "Storm Water Pollution Prevention Plan."

1.2 REVISION TO SECTION 00 4113 BID FORM:

- A. Replace Section 00 4113 Bid Form in its entirety.

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- 1.3 REVISION TO SECTION 00 6536 GUARANTY:
- A. Revise Title of Section 00 6536 Guaranty to read: “00 65 36 – Guaranty
 - B. Revise *partial paragraph* 1 to read: ...”for a period of **TWO (2)** years following the date...”
 - C. Revise *partial paragraph* 3 to read: “If within **TWO (2)** years after the date of Final Completion, ...”
- 1.4 REVISION TO SECTION 00 7213 GENERAL CONDITIONS:
- A. Clarify Part 6.2 Contractor’s Supervision, Item 6.2.1 for Project Manager time period on-site. Add clarification to read: “Project Manager Position to be full-time, on-site through *Completion of the Work* as described in Part 20 - General Conditions.”
 - B. Revise Part 6.8 Obtaining of Permits and Licenses, revise *partial paragraph* to read:”...for all permits (excluding building permit fees), licenses....”
 - C. Revise Part 14 Warranty/Guaranty/Indemnity, Item 14.1.5 revise *partial paragraph* to read: ...“for a period of **TWO (2)** years after the later of the following dates.”
 - D. Revise Part 14 Warranty/Guaranty/Indemnity, Item 14.1.5.2 revise *partial paragraph* to read: ...“and/or materials within a **TWO (2)** year period from date of...”
 - E. Revise Part 13.1.16 Commercial General Liability (each occurrence), revise text to read:”\$1,000,000.”
 - F. Revise Part 13.1.16 Commercial General Liability (general aggregate), revise text to read:”\$2,000,000.”
 - G. Revise Part 13.1.16 Excess Liability, revise text to read:”Cover up to amount of bid.”
- 1.5 REVISION TO SECTION 00 7300 SPECIAL CONDITIONS:
- A. Clarify Part 1 Cultural Resources Protection, add note #3 to read: “Contractors obligation is to securely cordon off the area as described in Item #1 and notify all necessary parties and described in Item #1.”
 - B. Replace Section 00 7300 Special Conditions in its entirety
 - C. Clarify Item 13 Appendices, Item Appendix G to read:”Room Ready Checklist for IT.”
- 1.6 REVISION TO SECTION 00 7316 INSURANCE:
- A. Revise *partial* Item 2 A General Liability to read:”\$1,000,000.....”
 - B. Revise *partial* Item 2 D Builders Risk Insurance to read:”.....in the amount of 100% (One hundred percent) of the....”

- 1.7 REVISION TO SECTION 01 3100 PROJECT MANAGEMENT AND COORDINATION:
- A. Revise Part 1.8 A, item #1 to read: "Software: Deltek I Axium Project Trek (formerly Archittrek)."
 - B. Clarify Part 1.8 A, add note #3 to read: "The *Project Trek* project management software cost is hosted by the Architect, there is no cost to the GC, subcontractors, design consultants, Owner, CM, etc. to use the software. The GC and subcontractor's will be required to enter information and upload documents into the tool to allow for the work flow management throughout the project, which does have an overhead cost element to the entities involved. The bidders should familiarize themselves with all the functionality of the *Project Trek* software training or user manuals available to them via the internet prior to bidding. Basic training (conference call) on the functionality of the management tool will be scheduled by the Architect for the awarded bidder."
- 1.8 REVISION TO SECTION 01 3200 CONSTRUCTION PROGRESS DOCUMENTATION:
- A. Clarify Part 1.4 B, add text to read: "The "detailed schedule of values" will be used for progress payment purposes. The cost loaded schedule will be required and used to track the contractor's progress, in comparison to a number of other metrics. The schedule update or data date and the progress payment application shall be stasured thru the same date. The schedule does not need to be resources loaded, just cost loaded."
- 1.9 REVISION TO SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS:
- A. Clarify Part 2.2, add Item C to read: " The Owner/CM/Arch will carry our own trailer, etc. costs, which includes a space large enough for the bi-weekly OAC meetings. Hopefully the contractor will allow use of their Blue Rooms if/when the need arises while on the project site."
- 1.10 REVISION TO SECTION 03 3000 CAST IN PLACE CONCRETE:
- A. Replace Section 03 3000 Cast in Place Concrete in its entirety.
- 1.11 REVISION TO SECTION 09 5113 ACOUSTICAL PANEL CEILINGS:
- A. Delete Part 3.3 B, Item #7 in its entirety.

1.12 REVISION TO SECTION 23 1123 NATURAL GAS PIPING:

Page 1, Part 1.1, A. add line "4. Gas meters."

Page 3, add paragraph 2.5 to read as follows: "GAS METERS

Provide natural gas sub-meters for the Maintenance and Administration buildings, each having an automated signal output compatible with the campus energy management control system. Gas consumption data shall be collected and delivered in accordance with LEED v3 Minimum Program Requirements.

Administration Building: 2-inch, 5psi, 1500 cubic feet per hour, outdoor, temperature compensated, with pulse output, gasket strainer, and mounting flange set. E-Mon F1 series, 1.5 million BTU, model GM-GMI-FM1-1.5M-2-ETCor equal.

Maintenance Building: 2-inch, 5 psi, 2365 cubic feet per hour, outdoor, temperature compensated, with pulse output, gasket strainer, and mounting flange set. E-Mon F2 series, 3 million BTU, model GM-GMI-FM2-3M-2.0-ETC or equal.

Provide gas regulator to reduce pressure from 5 psi to 7-inches water column at each meter."

Page 5, add paragraph 3.8 to read: "INSTALLATION – GAS METERS

Install meters with upstream shut-off valve.

Install service regulators in a well-ventilated area, at least 18-inches horizontally and ten feet vertically from any operable doors or windows."

1.13 REVISION TO SECTION 23 1213 FACILITY FUEL PUMPS AND DISPENSERS:

- A. Add to Part 2.2 C, Item #2 text to read:"Smart Submersible Turbine Pump Controller (Franklin Fuels Model STP-SCI)".
- B. Add to Part 2.3 C, Item #2 text to read:"Smart Submersible Turbine Pump Controller (Franklin Fuels Model STP-SCI)".

1.14 REVISION TO SECTION 23 2000 HVAC PIPING AND PUMPS:

Page 3, Revise paragraph 2.2, E. Flue and Combustion Air Piping, to read:

- 1. Flue and Combustion Air Piping:
 - a. Stainless Steel Pipe: Vent pipe constructed of AL29-4C or 29-4 (S44735) superferritic stainless steel, with a minimum thickness of .015" for diameters 3"-8".

- 1) Type: Factory built by a single manufacturer, single wall, for use on Category II, III and IV appliances.
- 2) Temperature and pressure: For a maximum continuous flue gas temperature of 550 degrees Fahrenheit, and an internal static pressure of 9" w.g.
- 3) Fittings: All parts shall be compatible with other single wall and double wall products of the same manufacturer, with common joint mechanism integral to each fitting..
- 4) Joints: Ring and tab mechanism, manufactured from AL29-4C or 29-4 (S44735), with factory installed gasket to seal joint, and gasket lube from the same manufacturer. Male and female overlapping metal-metal connection to contain condensate.
- 5) Sizing: Vent system is to be sized in accordance with appliance manufacturer's specifications, NFPA 54-National Fuel Gas Code (ANSI Z223.1), ASHRAE recommendations and other applicable codes."

B. Page 8, add paragraph 3.5, K to read:

- a. "Install Flue and Combustion Air Piping in strict compliance with manufacturer's instructions, and all pertinent local, regional, and national building and mechanical codes and regulations. Slope flue piping for 1/4" per foot pitch back to appliance so condensate flows back toward the appliance to the required drains at all times."

C. Page 9, revise paragraph 3.7, H to read:

- a. "Install air separator on suction side of system circulation pumps near expansion tank."

D. Page 10, add paragraph 3.9, F, to read:

- a. "Support horizontal combustion air and flue pipe adjacent to each fitting, with 5 feet maximum spacing between hangers.

1.15 REVISION TO SECTION 23 7300 INDOOR CENTRAL STATION AIR HANDLING UNITS:

Page 3, Add paragraph 2.1, B, 11 to read:

- A. "DX refrigeration final stage of cooling with all refrigeration specialties and controls furnished by the factory, including a refrigerant charge of R-410A."

Page 8, revise paragraph 2.1, K, 4 in entirety to read:

- B. "Condenser coils shall be of internally finned 1/2-inch copper tubes mechanically bonded to configured aluminum plate fins, and factory coated with Thermaguard protective coating for water vapor protection. Coils shall be leak tested at the factory to insure pressure integrity. The coils shall be rated at 450 PSIG."

Page 9, add paragraph 2.1, M, 5 to read:

- C. "Provide a sump water hardness sensor with factory automatic sump blow down to maintain water hardness levels at a factory set threshold level."

Page 9, delete paragraph 2.1, O, 4, b, "Fan isolation dampers."

Page 9, add paragraphs 2.1, O, 4, b, c, d and e to read as follows:

- D. "Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.
- E. Outdoor air shut off damper.
- F. Recirculation damper for morning warm-up."

Page 17, add paragraph 2.2, L, 5 to read:

- G. "Provide a sump water hardness sensor with factory automatic sump blow down to maintain water hardness levels at a factory set threshold level."

Page 18, delete paragraph 2.2, N, 4, b, "Fan isolation dampers."

Page 18, add paragraphs 2.2, N, 4, b, c, d and e to read as follows:

- H. "Direct Evaporative Cooler face and bypass, with factory installed and wired modulating actuator. Face and bypass shall provide modulation of supply air temperature.
- I. Outdoor air shut off damper.
- J. Recirculation damper for morning warm-up."

1.16 REVISION TO SECTION 26 0500 COMMON WORK RESULTS FOR ELECTRICAL:

- A. Replace Section 26 0500 Common Work Results for electrical in its entirety

1.17 REVISION TO SECTION 26 0519 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:

- A. Replace Section 26 0519 Low Voltage Electrical Power Conductors and Cables in its entirety

1.18 REVISION TO SECTION 26 2200 LOW VOLTAGE TRANSFORMERS:

- A. Replace Section 26 2200 Low Voltage Transformers in its entirety

1.19 REVISION TO SECTION 26 2416 PANELBOARDS:

- A. Replace Section 26 2416 Panelboards in its entirety

- 1.20 REVISION TO SECTION 26 3212 ENGINE GENERATORS:
- A. Replace Section 26 3112 Engine Generators in its entirety
- 1.21 REVISION TO SECTION 26 5100 LIGHTING:
- A. Replace Section 26 5100 Lighting in its entirety
- 1.22 REVISION TO SECTION 28 3111 FIRE DETECTION AND ALARM:
- A. Replace Section 28 3111 Fire Detection and Alarm in its entirety
- 1.23 REVISION TO SECTION 31 1100 SITE CLEARING AND GRUBBING:
- A. Clarify Part 3.2 E and F, add text to read: "The Owner has retained NorthStar Engineering to do all the Mitigation Monitoring survey's prior to the start of construction. The requirement for the contractor to retain a biologist for survey's for owl, hawks, etc. nests is removed from the bid documents. Should an active nest be found during this pre-construction survey, the mitigation measure actions described here would be followed. Since the Off-site project is starting first, this survey and any nests discovered will be known app. a month prior to the Onsite contractor's NTP date. The survey results will be forwarded to the Onsite Contractor prior to the start of work.
- 1.24 REVISION TO SECTION 32 9300 LANDSCAPE INSTALLATION:
- A. Replace Section 32 9300 Landscape Installation in its entirety

REVISIONS TO DRAWINGS

- 1.1 REVISION TO DRAWING C5.6 CIVIL DETAILS 6:
- A. Revise Detail 5, revise *partial* note to read:"concrete, paint color (P1)."
- 1.2 REVISION TO DRAWING L1.01 LANDSCAPE CONSTRUCTION PLAN:
- A. Revise Drawing 1, Add Sheet LA 1.0_2.
- 1.3 REVISION TO DRAWING L2.10 LANDSCAPE DETAIL SHEET:
- A. Revise Detail 3, Add Sheet LA 2.0_2

- 1.4 REVISION TO DRAWING A1.1 SITE PLAN:
 - A. Revise Drawing, Add Sheet AA 2.0_2
 - B. Revise Drawing, Add Sheet AA 3.0_2

- 1.5 REVISION TO DRAWING A3.1 DOOR SCHEDULES / FINISH SCHEDULES:
 - A. Revise Drawing, Add Sheet AA 4.0_2
 - B. Revise Drawing, Add Sheet AA 5.0_2

- 1.6 REVISION TO DRAWING A4.1 ADMIN / OPS EXTERIOR ELEVATIONS:
 - A. Revise Drawing, Add Sheet AA 1.0_2

- 1.7 REVISION TO DRAWING A7.1 INTERIOR ELEVATIONS:
 - A. Revise Drawing 7, east finish note to read:"T3"
 - B. Revise Drawing 8, west finish note to read:"T3"

- 1.8 REVISION TO DRAWING A7.2 INTERIOR ELEVATIONS:
 - A. Revise Drawing 2, finish note to read:"T3"
 - B. Revise Drawing 5, finish note to read:"T3"
 - C. Revise Drawing 7, west finish note to read:"T3"
 - D. Revise Drawing 8, east finish note to read:"T3"

- 1.9 REVISION TO DRAWING S4.0 MAINTENANCE BUILDING FAÇADE SUPPORT ELEVATIONS:
 - A. Revise Drawing, Add Sheet SA 1.0_2
 - B. Revise Drawing, Add Sheet SA 2.0_2

- 1.10 REVISION TO DRAWING M2.1 ADMINISTRATION/OPERATIONS HVAC PLAN:
 - A. Revise Drawing, Add Sheet MA 1.0_2

- 1.11 REVISION TO DRAWING M2.1 ADMINISTRATION/OPERATIONS HVAC PLAN:
 - A. Revise Drawing, Add Sheet MA 2.0_2

- 1.12 REVISION TO DRAWING M2.1 ADMINISTRATION/OPERATIONS HVAC PLAN:
 - A. Revise Drawing, Add Sheet MA 3.0_2

- 1.13 REVISION TO DRAWING M2.3 MAINTENANCE HVAC PLAN:
 - A. Revise Drawing, Add Sheet MA 4.0_2

- 1.14 REVISION TO DRAWING M2.3 MAINTENANCE HVAC PLAN:
 - A. Revise Drawing, Add Sheet MA 5.0_2

- 1.15 REVISION TO DRAWING M2.4 MAINTENANCE HYDRONIC PIPING PLAN:
 - A. Revise Drawing, Add Sheet MA 5.1_2

- 1.16 REVISION TO DRAWING M2.4 MAINTENANCE HYDRONIC PIPING PLAN:
 - A. Revise Drawing, Add Sheet MA 5.2_2

- 1.17 REVISION TO DRAWING M4.1 ENLARGED MECHANICAL ROOM PLANS:
 - A. Revise Drawing, Add Sheet MA 6.0_2

- 1.18 REVISION TO DRAWING M4.1 ENLARGED MECHANICAL ROOM PLANS:
 - A. Revise Drawing, Add Sheet MA 7.0_2

- 1.19 MECHANICAL DRAWINGS
 - A. Add Sheet MA 8.0_2
 - B. Add Sheet MA 9.0_2
 - C. Add Sheet MA 10.0_2
 - D. Add Sheet MA 11.0_2

- 1.20 REVISION TO DRAWING M6.2 MAINTENANCE HYDRONIC SCHEMATIC:
- A. Revise Drawing, Add Sheet MA 13.0_2
- 1.21 REVISION TO DRAWING M6.3 HVAC SCHEDULES:
- A. Revise Drawing, Add Sheet MA 12.0_2
- 1.22 REVISION TO DRAWING P0.1 PLUMBING SYMBOLS LEGEND AND INDEX:
- A. Revise Drawing, Add Sheet PA 1.0_2
- 1.23 REVISION TO DRAWING P2.2 MAINTENANCE PLUMBING PLAN:
- A. Revise Drawing, Add Sheet PA 2.0_2
- 1.24 REVISION TO DRAWING P2.4 FUELING STATION PLUMBING PLAN:
- A. Revise Drawing, Add Sheet PA 3.0_2
- 1.25 REVISION TO DRAWING P2.4 FUELING STATION PLUMBING PLAN:
- A. Revise Drawing, Add Sheet PA 4.0_2
- 1.26 REVISION TO DRAWING P2.4 FUELING STATION PLUMBING PLAN:
- A. Revise Drawing, Add Sheet PA 5.0_2
- 1.27 REVISION TO DRAWING P5.1 PLUMBING SCHEDULES:
- A. Revise Drawing, Add Sheet PA 6.0_2
- 1.28 REVISION TO DRAWING E1.1 SITE ELECTRICAL PLAN:
- A. Revise Drawing, Add Sheet EA 1.0_2
- 1.29 REVISION TO DRAWING E1.1 SITE ELECTRICAL PLAN:
- A. Revise Drawing, Add Sheet EA 2.0_2

- 1.30 REVISION TO DRAWING E1.1 SITE ELECTRICAL PLAN:
 - A. Revise Drawing, Add Sheet EA 3.0_2

- 1.31 REVISION TO DRAWING E1.3 ELECTRICAL YARD ENLARGED PLAN:
 - A. Revise Drawing, Add Sheet EA 4.0_2

- 1.32 REVISION TO DRAWING E1.3 ELECTRICAL YARD ENLARGED PLAN:
 - A. Revise Drawing, Add Sheet EA 5.0_2

- 1.33 REVISION TO DRAWING E2.5 MAINTENANCE LIGHTING PLAN:
 - A. Revise Drawing 3 note to read:"typ. of 12".

- 1.34 REVISION TO DRAWING E6.1 SINGLE LINE DIAGRAM:
 - A. Revise Drawing, Add Sheet EA 6.0_2

- 1.35 REVISION TO DRAWINGS Q2.3 BUS WASH BUILDING – EQUIPMENT LAYOUT PLAN
 - A. Revise Drawings, Add Sheet QA 2.0_2

- 1.36 EQUIPMENT DRAWINGS
 - A. Add Sheet QA 2.1_2

ADDENDUM NO. 2

Attendance Sheet

PROJECT: **BRTOC On-site**

MEETING: **Pre-Bid Conference**

Date: Tuesday, July 29th, 2014

Time: 10:00 a.m.

Location: Courtyard hotel Conference Room
 2481 Carmichael Drive, Chico, Ca. 95928

NAME	FIRM/ADDRESS/PHONE/FAX	E-MAIL
<i>Kirk Sheeley</i>	<i>Kitchell 2750 Gateway Oaks Dr., Ste. 300 Sacramento, CA 95833 Phone: 916-648-9700</i>	<i>ksheeley@kitchell.com</i>
<i>Stephon Seibly</i>	<i>ELT Const. Victor Rd Lodi CA.</i>	<i>sseibly@F-hconst.com</i>
<i>Jerry Hogan</i>	<i>Clark & Sullivan jhogan@clarksullivan.com</i>	<i>jhogan@clarksullivan.com</i>
<i>DREW LINDSAY</i>	<i>ROEBBELEN CONTRACTING 1241 HAWKS FLIGHT CT EL TORADO HILLS, CA 95762 (916) 939-1118</i>	<i>Estimating@roebbelen.com</i>
<i>Craig Herbert</i>	<i>DeWitt Bros 3293 Industrial Dr Vallejo City CA 95993 (530) 755-4334</i>	<i>dewittbrosandcoe@aol.com</i>
<i>Rich Carlson</i>	<i>Diede Construction Inc. P.O. Box 1007 Woodbridge, CA 95258 (209) 369-8255</i>	<i>estimating@diiedeconstruction.com</i>
<i>Lou Ackerman</i>		<i>lou@sierranewada.com</i>

NAME	FIRM/ADDRESS/PHONE/FAX	E-MAIL
LAMONT HURDEN RYAN GOWDY	SWINERTON BUILDERS 15 BUSINESS PARKWAY, SUITE 101 SAC, CA 95828 916.383.4025	LHURDEN@SWINERTON.COM RGOWDY@SWINERTON.COM
CLARK GARDNER	FRANKLIN CONSTRUCTION 217 FLUME ST SUITE 200 CHICO, CA 95928 530 343 9600	CLARK@FRANKLIN CONSTRUCTION.COM

Labor Compliance Monitoring



- **Certified Payrolls due every two weeks from GC and all subcontractors, regardless of tier level.**
- **The greater of State DIR or Federal Davis-Bacon Act prevailing wage rates apply, at the time of the work.**
- **Statements of Non-performance must be provided from start of work element thru final completion.**
- **Training Fund contributions must be confirmed.**
- **Registered Apprentices at the DIR website will be confirmed.**
- **All Certified Payroll documents to be provided electronically as pdf's and sent to; BRTOC.payroll@kitchell.com .**

00 41 13 - BID FORM

To be submitted as part of bid by the time and date specified in Section 00 21 13 (Instructions to Bidders), paragraph 1.

TO THE BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

THIS BID IS SUBMITTED BY:

(Firm/Company Name)

Re: **BCAG, Butte Regional Transit Operations Center**

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the Butte County Association of Governments ("Owner") in the form included in the Contract Documents, Section 00 52 13 (Agreement), to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of the Contract Documents.
2. Bidder accepts all of the terms and conditions of the Contract Documents, Section 00 11 13 (Advertisement for Bids), and Section 00 21 13 (Instructions to Bidders), including, without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for ninety (90) Days after the day of Bid opening.
3. In submitting this Bid, Bidder represents:
 - (a) Bidder has examined all of the Contract Documents and the following Addenda (receipt of all of which is hereby acknowledged).

Addendum No.	Addendum Date	Signature of Bidder

- (b) Bidder has visited the Site and performed tasks, reviews, examinations, and analysis and given notices, regarding the Project and the Site, as set forth in Section 00 52 13 (Agreement), Article 5.
- (c) Bidder has received and examined copies of the geotechnical data, existing conditions and hazardous material surveys listed in Section 00 31 00.
- (d) Bidder has given the Owner prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents, geotechnical data, existing conditions and hazardous material surveys, and actual conditions. The written resolution thereof through Addenda issued by the Owner is acceptable to Contractor.

4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sums of money listed in the following Schedule of Bid Prices:

SCHEDULE OF BID PRICES

All Bid items must be filled in completely or will be considered non-responsive. Section 01 10 00 (Summary of Work) describes the scope of work to be performed under this contract. Section 01 23 00 (Alternates) describes the scope of work for the alternates. Quote in figures only, unless words are specifically requested.

Unit Price No. 1 – Tire Derived Aggregate (TDA) bio-swales per Section 31 23 23. : \$_____ / lump sum. Unit price shall include all trenching, filter fabric, TDA aggregate, delivery costs, placement including compaction, sample wells, and testing for the complete system. The undersigned Bidder certifies they have reviewed and agree to meet all their obligations to comply with the CalRecycle Grantee obligations identified at Section 00 73 00 – Special Conditions. Include Unit Price in Base Bid below, amount listed here for accounting purposes only with Grantor.

Unit Price No. 2 – Steel allowance of 3%: \$_____ / lump sum. Contractor shall provide an allowance equal to 3% of the Bid for Structural Steel, Misc Iron and Reinforced steel to be used at the discretion of the Owner. Unit price shall include all detailing, estimating, small tools, welding power, materials, labor, equipment including hoisting, etc. in anticipation of Owner changes made on the project. Allowance shall be consumed with prior agreement of Architect and Owner only. Unused amount to revert to the Owner upon project closeout.

Bid Prices:

ITEM	DESCRIPTION	PRICE
1.	Lump Sum Base Bid Price: All Work of Contract Documents other than Work separately provided for under other Bid items	\$
2.	Alternate No. 1 – Add Standby Engine Generator	\$
3.	Alternate No. 2 – Add planting and irrigation in lieu of hydroseeding	\$

Lump Sum Base Bid Price: _____
 (Words)

5. The Owner will determine the low Bidder on the basis of the sum of the Lump Sum Base Bid plus the daily rate for Compensable Delay multiplied by the “multiplier” as stated in the Bid Form, plus the amounts of all Alternates. The Contract Sum will be the sum of the Lump Sum Base Bid and the additive amounts for all Alternates that Owner has selected to be included in the Contract Sum as of the time of award.
6. **DAILY RATE OF COMPENSATION FOR COMPENSABLE DELAYS**
 Bidder shall determine and provide below the daily rate of compensation for any Compensable Delay caused by Owner at any time during the performance of the Work:

\$, . X 30 days multiplier

Failure to fill in a dollar figure for the daily rate for Compensable Delay shall render the bid nonresponsive. Owner will perform the extension of the daily rate times the multiplier.

The daily rate shown above will be the total amount of Contractor entitlement for each day of Compensable Delay caused by Owner at any time during the performance of the Work and shall constitute payment in full for all delay costs, direct or indirect, of the Contractor and all subcontractors, suppliers, persons and entities under Contractor on the Project, including without limitation all subcontractors added by Contract Amendment. The number of days of Compensable Delay shown as a "multiplier" above is not intended as an estimate of the number of days of compensable delay anticipated by the Owner. The Owner will pay the daily rate of compensation only for the actual number of days of Compensable Delay, as defined in the General Conditions; the actual number of days of compensable delay may be greater or lesser than the "multiplier" used above for bid analysis.

7. The undersigned Bidder understands that the Owner reserves the right to reject this Bid. The undersigned Bidder acknowledges that the Butte County Association of Governments reserves the right to include any or none of the alternates in the contract.
8. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Award, is mailed or delivered to the undersigned Bidder within the time described in paragraph 2 of this Section 00 41 13 or at any other time thereafter before it is withdrawn, the undersigned Bidder will execute and deliver the documents required by Section 00 21 13 (Instructions to Bidders) within the times specified therein.
9. Notice of Award or request for additional information may be addressed to the undersigned bidder at the address set forth below.
10. The undersigned Bidder herewith encloses cash, a cashier's check, or certified check of or on a responsible bank in the United States, or a corporate surety bond furnished by a surety authorized to do a surety business in the State of California, in form specified in Section 00 21 13 (Instructions to Bidders), in the amount of ten percent (10%) of the Total Bid Price and made payable to the "Butte County Association of Governments".
11. The undersigned Bidder agrees to commence Work under the Contract Documents on the date established in Section 00 55 00 (Notice to Proceed) and to complete all work within the time specified in Section 00 55 00 (Notice to Proceed). The undersigned Bidder acknowledges that the Owner has reserved the right to delay or modify the commencement date. The undersigned Bidder further acknowledges the Owner has reserved the right to perform independent work at the Site, the extent of such work may not be determined until after the opening of the Bids, and that the undersigned Bidder will be required to cooperate with such other work in accordance with the requirements of the Contract Documents.
12. The undersigned Bidder agrees that, in accordance with Section 00 72 13 (General Conditions) and Section 00 73 00 (Supplementary Conditions), liquidated damages for failure to complete all Work in the Contract within the time specified shall be as set forth in Section 00 31 13 (Construction Durations, Phasing and Milestones).

13. The names of all persons interested in the foregoing Bid as principals are:

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full).

NAME OF BIDDER: _____

Licensed in accordance with the act for the registration of Contractors, and with

License Number: _____

Expiration: _____

Where incorporated, if applicable

Principals

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Signature of Bidder

NOTE: If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address: _____

Officers authorized to sign contracts: _____

Telephone Number(s): _____

Fax Number(s): _____

E-Mail address: _____

Federal ID Number: _____

Date of Bid: _____

END OF SECTION

00 73 00 - SPECIAL CONDITIONS

1. Mitigation Measures and Environmental Stewardship

Contractor shall comply with all mitigation measures, adopted by the Butte County Association of Governments (BCAG) with respect to this Project pursuant to the California Environmental Quality Act, (Public Resources Code section 21000 et.seq.).The contractor is responsible for all requirements in the permitting documents and environmental impact report mitigation requirements, made a part of this agreement in attached **Appendix A**. Contractor is to extend extra efforts when working in areas of special concerns identified in these documents.

The summary below is intended to assist in bidding but may not be inclusive of all of the requirements of the contract documents.

Species Protection:

This Project is within or near habitat for regulated species shown below:

- BCAG Butte Regional Transit Operations Center project, Negative Declaration Mitigation, Monitoring Measures, and Reporting Program, included at **Appendix A**.

The contractor is responsible for all requirements in the Mitigation Measures requirements made a part of this agreement at **Appendix A**. Contractor is to extend extra efforts when working in areas of special concerns identified in this document.

Biological Resources of heightened concern;

- MM Biological 5 - Western Burrowing Owls (Transit Facility Site).
- MM Biological 6 - Swainson's hawks (Transit Facility Site).
- MM Biological 7 - Migratory birds and raptors (Transit Facility Site).

Cultural Resources of heightened concern;

- MM Cultural 1 – Contractor is hereby informed that if any cultural materials are encountered, all work within 100 feet of the discovered site shall cease....

Hydrology and Water Quality Resources of heightened concern;

- MM Water Quality 1 - To minimize erosion entering Comanche Creek during construction, the BMPs listed shall be required and are incorporated into the agreement for the project and will be implemented by the contractor to protect water quality.....

General Protection Measures:

1. Contractor will be familiar with and will comply with all environmental permits.
2. Contractor shall keep a binder with all permits onsite for reference at all times.
3. Contractor to notify BCAG 10 working days prior to the start of construction to schedule the BCAG provided biologist to conduct pre-construction migratory bird surveys and notify permitting agencies.
4. Contractor to maintain a clean work site with all trash (especially food wrappers) contained in trash receptacle to prevent attracting wildlife to the site.

Protection Measures for Nesting Migratory Birds, Red Bats, & Burrowing Owls:

1. BCAG provided biologist is required conduct a survey for all birds protected by the MBTA, red bats, & burrowing owls and map all nests located within 500 feet of construction areas.

2. BCAG provided biologist will develop buffer zones around active nests in coordination with CDFG. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails. Nests shall be monitored at least twice per week and a report submitted to CDFG monthly.

Protection Measures for Swainson’s Hawk:

1. BCAG provided biologist is required conduct a survey for Swainson’s Hawk nests located within ½ mile radius of construction areas.
2. If a nest is found and work must occur a BCAG provided biologist will monitor the nest site. If it is abandoned and if the nestlings are still alive, the BCAG shall fund the recovery and hacking (controlled release of captive reared young) of the nestling(s).

Protection Measures for Water Quality and Aquatic Life:

1. Contractor to maintain water quality BMP’s as required in project permits. No siltation is allowed to pass the sediment barrier.
 - a. Minimize turbidity/siltation with appropriate sediment barriers.
 - b. No plastic monofilament or cross joint in netting that are bound/stitched (such as straw wattles/fiber rolls, and some erosion control blankets) are allowed.
 - c. Upon completion of work stabilize site with appropriate erosion control vegetation and then remove barriers.
 - d. Implement SWPPP BMP’s.
2. Contractor is to conduct water sampling per the Central Valley Regional Water Quality Control Board 401 permit, “Additional Technically Conditioned Certification.
3. Restore site as required in Plans and Specifications.

Cultural Resource Protection:

1. If any cultural materials (e.g. bones, pottery fragments or other potential cultural resources) are encountered or unearthed during construction, all work within 100 feet of the discovered site shall cease. Further, the Contractor shall immediately notify BCAG and the Butte County Coroner pursuant to Section 7050.5 of California’s Health and Safety Code, and contact the Planning Services Department at 879-6800 as soon as possible. BCAG shall then retain an archeologist from the City’s list of qualified archeologists to evaluate the significance of the site. If the archeologist determines that the materials represent a potentially significant resource, the project proponent, archeologist, City Planning Director, and local tribal coordinator shall begin a consultation process to determine a plan of action either for 1) total data recovery, as a mitigation, 2) tribal cultural resource monitoring, 3) displacement protocol, or 4) total avoidance of the resource.

Full compensation for furnishing all labor, tools, equipment, material and incidentals and for doing all the work involved with conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work and no additional compensation will be allowed therefor.

2. Water Pollution Control

The Contractor shall be required to submit an updated Storm Water Pollution Prevention Plan (SWPPP) which complies with the conditions of the Water Quality Order 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES), General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). The SWPPP shall be prepared with guidance from the City of Chico Best Practices Manual, the City of Chico Best Practices Technical Manual, and Caltrans Storm Water Quality Handbooks. This plan shall be approved by the QSD prior to beginning any work. The Contractor shall be responsible for implementing, maintaining, and monitoring such water pollution control measures as called for in the SWPPP, and as directed by the Owner.

Contractor to:

- a. Prepare updates to Storm Water Pollution Prevention Plan (SWPPP) already prepared by QSD and uploaded to SMARTS website. SWPPP preparation includes obtaining SWPPP acceptance and amending the SWPPP.
- b. Install BMP's per approved SWPPP as required throughout construction as detailed in the SWPPP. Maintain, repair, clean, or replace BMP's as needed throughout project to ensure no site discharges occur.
- c. Prepare and implement a SWPPP monitoring program in compliance with the latest California NDPEs Storm Water Pollution Prevention rules. All monitoring shall be documented and reported as required to State of California SMARTS website.
- d. Prepare Rain Event Action Plans (REAPs) if specified for the project risk level, REAP preparation includes preparing and submitting REAP forms and monitoring weather forecasts.
- e. Complete all required Storm Water Sampling and Analysis. Storm Water Sampling and Analysis may include reporting of storm water quality per qualifying rain event. If specified for the risk level, the work includes preparation, collection, analysis, and reporting of storm water samples for turbidity, pH, and other constituents.
- f. Prepare and submit all required Storm Water Annual Reports. Storm Water Annual Report preparation includes certifications, monitoring and inspection results, and obtaining Storm Water Annual Report acceptance.
- g. Contractor is to assume maintenance and cleaning of all BMP's placed adjacent to the site upon completion of all offsite work. Contractor is to assume responsibility of the SWPPP responsibilities from the Off-site Contractor.
- h. Contractor is to work with the Owner at the time they develop the Industrial SWPPP for the site, to ensure the two separate SWPPP's uploaded to the SMARTs website do not include overlapping areas of responsibility prior to the completion of the Phase 1 construction milestone.

Copies of the General Permit, the manuals, and the handbook referred to above are available on the Internet at

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

The Contractor shall be responsible for inspecting the work site a minimum of once at the beginning and once at the end of the work day to insure that pollution control measures as specified in the SWPPP are in place and functioning properly. Inspections will also be required on non-work days when rainfall is forecasted. Monitoring shall be required for all rainfall events whether on work or non-work days. Unless specified otherwise in the approved SWPPP, Contractor-performed monitoring duties shall end when the project Notice of Completion is filed with the County Recorder and the Notice of Termination acceptance by the RWQCB, which includes all annual reports and support documentation. All inspections and monitoring shall be documented in a log that will be maintained on site with the approved SWPPP.

Note special seed restriction for erosion control & hydro seeding regarding variety is required due to adjacent organic farming. Attention is directed to Section 3, Relations with Adjacent Property Owners.

Should the Contractor be found not to be in compliance with the approved SWPPP and the requirements in these Special Provisions, he shall be fined \$2,000 for the first occurrence and \$3,000 for each occurrence thereafter. The fine shall not relieve the Contractor's obligation to indemnify BCAG from third-party lawsuits as a result of the Contractor's actions.

If the Contractor has been found not to be in conformance with the approved SWPPP and fails to provide the required maintenance of the pollution control devices within the same day that he is notified of the deficiency, BCAG reserves the right to complete the work necessary to bring the devices into conformance with the SWPPP. In addition to the fine stated above, BCAG shall charge the Contractor for the actual cost of such maintenance, which shall be deducted from the Contractor's next progress payment.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals for doing all the work involved in preparing any revisions or updates to the SWPPP and supplying, installing, monitoring, and maintaining the measures implemented as part of the SWPPP as required by the Standard Specifications and these Special Provisions, and as directed by the Engineer.

The Owner will recognize the following percentages in the Schedule of Values for preparing storm water pollution prevention plan and implementation as follows:

1. A total of 90 percent of the item total over the life of the contract.
2. A total of 100 percent of the item total upon accepted Notice of Termination from RWQCB SMARTs website.

Compensation for providing air pollution control and dust control and noise control shall be included in the prices paid for other items of work in the contract, and no additional payment shall be made.

3. **Tire Derived Aggregate (TDA) at Bioswales Grantee Requirements**

This project has received a Grant from CalRecycle to compensate for Tire Derived Aggregate (TDA) used at the bioswales throughout the project site, see Sheets C1.3 & C5.5. The Grant includes conditions that must be met by Grantee which are made a requirement of the Contractor also. These requirements are primarily cost reporting in nature involved to complete the TDA installation, see **Appendix B** for the requirements Contractor is obligated to meet and/or provide.

The Contractor certifies they have reviewed and agree to meet all their obligations to comply with the CalRecycle Grantee & Contractor obligations identified at the Grant documents included and made a part of this agreement;

- The complete work to install Tire Derived Aggregate/TDA derived from only California generated waste tires at bio-swales shall be completed no later than January 1, 2016, to comply with the Grant terms and allow for payment by CalRecycle on a reimbursement basis prior to grant deadlines. This must include As-built drawings for the TDA installation, which have been verified by a site survey and certified by a Registered Civil Engineer, and a laboratory analysis and gradation report of the TDA material delivered to the jobsite.
- Contractor certifies all contractors involved with the TDA scope of work are NOT on the CalRecycle Unreliable List by completing the State of California, Reliable Contractor Declaration, CalRecycle form 168, prior to the start of any TDA work. This form must be uploaded along with other reporting requirements to the CalRecycle's Grant Management System (GMS). If the Contractor/Subcontractor/Manufacturer involved with the TDA work is placed on the CalRecycle's Unreliable List at any time during this project, the Contractor is obligated to and agrees to replace that party immediately to ensure the Owner's Grant Funding is not lost, see Grant Exhibit A – Terms and Conditions. Should contractor's actions/inactions result in loss of Grant funding to the Owner, Contractor shall be liable for lost funding in an equal amount to be credited via the next change order processed on the project.
- Contractor and/or TDA supplier/manufacturer must complete the State of California, Tire Derived Aggregate (TDA) Certification, CalRecycle form 740-TDA, prior to providing any material to the site.
- The Contractor and/or TDA supplier/manufacturer shall comply with all audit and record keeping requirements of CalRecycle, Department of Finance, the Bureau of State Audits, to ensure the Grant requirements are complied with. Contractor shall provide separate Personnel Time Logs / timesheets to the Owner for audit purposes only, using the Personnel Expenditure Itemized summary, CalRecycle form 165, <http://www.calrecycle.ca.gov/grants/forms/General/CalRecycle165.pdf> .
- All correspondence, schedule of values, project documentation, etc. relative to the TDA work and CalRecycle Grant shall reference the Grant Number; TDA3-13-0009.
- Contractor to provide the executed Reliable Contractor Declaration, CalRecycle form 168, as a priority, and no later than 30 days after the NTP date for the project.

4. Relations with Adjacent Property Owners
Sierra Nevada Brewery

This project is located adjacent to lands owned by Sierra Nevada Brewery (SNB). A memorandum of understanding (MOU) has been entered into by BCAG and Sierra Nevada Brewery. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly. The contractor shall not impact the active operations of SNB. Sierra Nevada receives 8 to 10 train-cars per week at the adjacent property, and the contents are then trucked to the brewery through the intersection at the corner of Huss and Aztec Drives on public roadways.

Notify SNB at least 48 hours in advance of any work which may affect SNB property. Deliveries to the project site should be scheduled so the SNB operations are not negatively impacted. Contractor is obligated to cooperate and schedule work so SNB operations are not impacted to the extent required by the MOU. Owner's obligations are made a part of this agreement and Contractor will cooperate in all respects BCAG is obligated.

Dust Control: Contractor shall take all measures deemed required to maintain a Zero Dust Policy for all equipment, operations and deliveries near the SNB property. This applies to scrapers, loaders, semi-truck and trailers, pick-ups, excavators, etc. The creation of dust on this property will have a negative effect on the success of the farming operations and ultimately the crop yields. Contractor shall maintain a water truck on-site during any period to ensure dust conditions can be dealt with immediately. Contractor shall tarp all truckloads of soil export while driving adjacent to the SNB Farm property, to ensure the dust contamination is minimized. Vehicle speeds shall be reduced to a maximum of 15 mph.

Contractor is required to provide SNB with weekly look ahead schedules when work may affect trucking operations on city streets adjacent to project site. The SNB point of contact is:

David Tamble, Transload Operations Manager, tamble@sierranevada.com or
 Lau Ackerman, Agricultural Supervisor, lau@sierranevada.com
 1075 East 20th Street
 Chico, CA 95928
 (530) 510-5085

Sierra Nevada Brewery (SNB) operates organic farming adjacent to this project. Special considerations shall be taken to avoid disturbing the farming operations:

1. Laydown, material, and equipment storage areas shall be kept off SNB lands.
2. SNB shall have continuous access to their property for trucking and agricultural uses. Contractor shall maintain a minimum of 12' clear lane at all times, including in city streets and public right of way. Contractor is to provide flagmen as needed to ensure the continuous operation of the SNB deliveries thru the site, and ensure all contractor equipment and deliveries yield the right of way to the SNB grain transfer.

Contractor is responsible for the costs to repair or other property damage caused by the construction operations. Note special restrictions for erosion control hydroseed mix is required due to adjacent organic farming. Erosion control seed mix shall include only the following pre-approved varieties. Substitutions must be approved by SNB landscape supervisor.

<u>Botanical Name</u>	<u>Common Name</u>
Melica californica	California melicgrass
Leymus Triticoides	Creeping Wildrye

Hegan Lane Business Partners

This project is located adjacent to lands owned by Hegan Lane Business Partners (HLBP). A Permit to Enter and Construct (PTEC) has been entered into by BCAG and Hegan Lane Business Partners, see **Appendix C**. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly. The contractor shall not impact the active operations of HLBP, and shall name HLBP as additional insureds in all policy's required for the project. Any spoils stockpiles on HLBP adjacent property shall be placed per the requirements of the stockpile layout and sections given at this **Appendix C**.

5. Work by Other Contractors

The Butte Regional Transit Operations Center project will be advertised and divided into multiple discreet projects, each with its own contractor. The Contractor bidding on this project shall be aware of and work cooperatively with other contractor's working adjacent to or on the same site as this contractor. The Contractor agrees to communicate and coordinate their work and the work of other contractor's as though the work is its own. The multiple prime contracts are required due to funding and time constraints, and Contractor is made aware of this and agrees to work in this delivery method with no further claims for cost or time impacts to the Owner as a result of this delivery method. Owner reserves the right to procure other contractors or vendors as needed to complete the project within the time or fiscal constraints required, and contractor agrees to work with such furniture, data, and security or maintenance contractors in the same manner as called for here.

- BRTOC Off-site Plans for Aztec Drive Extension & Comanche Creek Storm Drainage Outfall
- BRTOC On-site plans
- BRTOC Remodel of Existing Building

6. Plans and Bid Documents

See Section 00 11 16 – Invitation to Bid for instruction on obtaining plans and specifications for bidding.

Plans bid documents may be examined at the Butte County Association of Governments Office, located at 2580 Sierra Sunrise Terrace Chico, California, or various Builders Exchanges in the area. Copies of all bid documents are to be requested and obtained through ARC Document Solutions. Technical Questions should be directed to the BCAG offices in Chico, CA, contact Andy Newsum PE, Deputy Director, email anewsum@bcag.org, Fax 530-879-2444.

Interested parties may download copies of bid documents related attachments and all future communication and correspondence regarding this bid process from the County's website at <http://www.bcag.org/RFPs/index.html> (follow the prompts for RFP's/Bid Notices). The Butte County Association of Governments will not be a distribution point for plans.

The Butte County Association of Governments affirms that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises (DBE) will be afforded full opportunity to submit bids in response to this invitation.

7. Water Main work Owned & Inspected by California Water Service

The work performed in connection with Domestic Water, Irrigation Water Services & Fire Water Systems shall conform to the plans and specifications of the local water service provider, California Water Service Company (Cal Water). Cal Water is preparing plans and specifications specifically for this project and will be providing inspection of the installation. **These plans will be issued via addendum or after bid day upon receipt when Cal Water completes their design.** The design is not expected to differ materially from that design by GHD included in the bid documents now. The contractor is to complete the installation following all Cal Water requirements and direction.

The Cal Water Service Company (Cal Water) Subdivider and Contractor Requirements for Subdivider Installation Agreement and Rule No. 15 – Main Extensions requirements are made a part of this agreement by inclusion here, see **Appendix D**. The Cal Water requirements for the installing contractor of all water services to be Owned and Maintained by Cal Water at completion of the project shall be complied with. See the sample agreement included as for a list of current Approved Installing Contractors the contractor is obligated to use for the installations designed by and ultimately owned by Cal Water.

COST BREAK DOWN. The Contractor shall furnish the Owner a cost break down for the work of Domestic, Irrigation and Fire Water System including hydrants shown on the civil plans. A cost break down table shall be submitted to the Owner for approval within 15 working days after the contract has been approved or the Cal Water design, whichever comes later.

Cost break downs shall be completed and furnished in the format shown in the samples of the cost break downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break downs to be furnished by the Contractor. The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break downs submitted to the Owner for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break downs submitted for approval. Overhead and profit shall be included in each individual line item of work listed in a cost break down table.

No adjustment in compensation will be made in the contract lump sum prices paid for water system due to differences between the quantities shown in the cost break downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break down tables will be used to determine partial payments during the progress of the work. The Cost Break-down is also required to be provided to Cal Water Service prior to the start of Water Main Installation work.

Sample Cost Break-Down

<u>UNIT DESCRIPTION</u>	<u>UNIT</u>	<u>APPROXIMATE QUANTITY</u>	<u>VALUE</u>	<u>AMOUNT</u>
12" DUCTILE IRON WATER LINE				
8" C-900 WATER LINE				
6" C-900 WATER LINE				
FIRE HYDRANT ASSEMBLY				
12" VALVE				
8" VALVE				
6" VALVE				
BLOW OFF ASSEMBLY				

TOTAL; _____

8. Clean Water & Air Requirements

The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract agreement.

This project lies within the boundaries of the Central Valley Regional Water Quality Control Board (RWQCB). The Central Valley RWQCB has issued a permit which governs storm water and non-storm water discharges resulting from construction activities in the project area. The RWQCB permit is entitled "National Pollutant Discharge Elimination System (NPDES) Construction General Permit 2009-0009-DWQ". Copies of the RWQCB permit may be obtained at the BCAG Offices, 2580 Sierra Sunrise Terrace, Suite 100, Chico, CA 95928.

The NPDES permits that regulate this project, as referenced above, are collectively referred to in the agreement as the "permits". This project shall conform to the permits and modifications thereto. The Contractor shall maintain copies of the permits at the project site and shall make them available during construction.

The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract.

Contract execution constitutes submittal of the following certification by the Contractor:

"I am aware of the emissions reduction regulations being mandated by the California Air Resources Board. I will comply with such regulations before commencing the performance of the work and maintain compliance throughout the duration of this contract."

The Contractor shall be familiar with and comply with all monitoring, reporting, notifications, and control requirements of agencies having jurisdiction over air quality.

The Contractor shall prevent the formation of an airborne dust nuisance by watering work areas as required until the project is completed and accepted. The amount of water used shall not be excessive to cause soil carry-over or wash-off outside the boundaries of the working area. If soil wash-off occurs, the Contractor shall immediately notify the Engineer and identify the area where wash-off occurred. The Contractor shall provide polyethylene sheeting to place underneath and over any stockpiled soil. The stockpile shall be covered daily after completion of work. The sheeting shall be adequately weighted or secured to keep the sheeting in place during non-work periods.

9. Indemnification

In addition to the requirements for Indemnification given at Section 00 72 13 - General Conditions, Section 14.2, the contractor shall include the following specifically by name as Additional Insureds on their insurance certification;

- Butte County Association of Governments
- Kitchell
- TLCD Architecture
- City of Chico

- Sierra Nevada Brewery (SNB)
- Hegan Lane Business Partners
- California Water Service Company

Including their officers, directors, employees, agents, and design professionals.

10. Encroachment Permit

Prior to start of work within the City of Chico's right-of-way, the contractor will be required to obtain an Encroachment Permit from the City of Chico. Contactor shall pay all associated encroachment fee costs. The City of Chico's procedures to obtain an encroachment permit included below.

PROCEDURE TO OBTAIN AN OFFSITE ENCROACHMENT PERMIT

Step 1: Contractors wishing to obtain an encroachment permit, must have the following:

- Pre-approved Excavation Bond form (provided by the City of Chico) in the amount of \$10,000 OR an Excavation Bond form provided by an insurance company which has been approved by the City Attorney.
- Certificate of GENERAL LIABILITY, in the amount of \$1,000,000, which has been approved by the City of Chico Risk Manager (530) 879-7900.
- State contractor's pocket license which shows the following information:
 - License number;
 - Classification(s); and
 - Expiration date
- Letter from corporation/company/sole proprietorship authorizing specific employees/agents to sign Encroachment Permits on behalf of said entity.
- City of Chico Business License - Contact the Finance Dept. @ (530) 879-7300.
- Correct and current name of owner/lessee/agent/business, with mailing address(es).

Step 2: Provide this sheet, which is part of the Application process, at the time the Encroachment Permit is requested.

Plan Approval Date:	6/9/14 <i>MD</i>	Proj. Acct: 72173
Subdivision Name:	BCAG Transit Center	
Parcel Map No. (Name):		
APN(s):	Portions 039-060-125 and 126	
Address(es):	Huss Lane	

Step 3: Encroachment Permits are obtained at the Building Permit counter, on the 2nd floor of City Hall.

Step 4: Please allow 1 - 2 days for processing.

Step 5: The City will contact you when the encroachment permit is ready to be signed and picked up.

11. Weather Days

Delays due to Adverse Weather conditions will only be permitted in compliance with the provisions in the General Conditions and only if the number of days of Adverse Weather exceeds the following parameters:

January	6	July	0
February	6	August	0
March	4	September	0
April	4	October	2
May	1	November	4
June	0	December	6

Total; ... 33 CD's/Year

The construction schedule shall include critical path activities as the last activities prior to the Final completion milestone that reflects anticipated rain delay for each month during the performance of the Contract. No other activity shall be concurrent with the weather allowance days. The duration shall reflect the average climatic range and usual industrial conditions prevailing in the locality of the Site. Weather data shall be based on information provided by the National Weather Service and as indicated in the table provided here. Comply with all other requirements for weather as provided at section 01 32 00 – Construction Progress Documentation. Contractor shall release the weather days each month as that's month's Schedule Update is statused to provide a true and accurate representation of weather impact which is current thru the end of that month's data date.

Permits, Certificates, Licenses, Fees, Approval

- a. **Payment for Permits, Certificates, Licenses, and Fees.** As required in the General Conditions, the Contractor shall secure and pay for all permits, licenses and certificates necessary for the prosecution of the Work with the exception of the following:
- (1) **City of Chico Building & Encroachment Permits**
- With respect to the above listed items, Contractor shall be responsible for securing such items; however, Owner will be responsible for payment of these charges or fees without contractor any mark-ups. Contractor shall notify the Owner of the amount due with respect to such items and to whom the amount is payable. Contractor shall provide the Owner with an invoice and receipt with respect to such charges or fees.
- b. **Storm Water Permits**
- (1) Contractor acknowledges Owner is now or will soon be obligated to develop and implement the following storm water requirements, without limitation:
- (A) A Municipal Separate Storm Sewer System (MS4). An MS4 is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.
- (B) A Storm Water Pollution Prevention Plan (SWPPP) at:
- (i) Industrial sites where the Owner engages in maintenance (e.g., fueling, cleaning, repairing) of transportation activities.
- (ii) Construction sites where:
- (a) One (1) or more acres of soil will be disturbed, or
- (b) The project is part of a larger common plan of development that disturbs more than one (1) or more acres of soil.
- (2) Contractor shall comply with Owner storm water requirements that are approved by the Water Resources Control Board and applicable to the Project, at no additional cost to the Owner, see **Appendix E** and SWPPP/BMP requirements in the bid documents.

13. APPENDICIES:**APPENDIX A**

BCAG Negative Declaration Mitigation Monitoring Measures

APPENDIX B

Tire Derived Aggregate (TDA) grant requirements for contractor to comply with

- 1) Grant Agreement cover sheet.
- 2) Grant Terms and Conditions, Exhibit A 10 pages dated 9/12/13.
- 3) Grant Procedures and Requirements, Exhibit B 11 pages FY 2013 / 2014.
- 4) Forms Guide, 1 page.

- 5) Reliable Contractor Declaration, CalRecycle form 168, 2 pages Revised 7/2013.
- 6) Tire Derived Aggregate (TDA) Certification, CalRecycle form 740-TDA, 2 pages dated 8/13.

APPENDIX C

- 1) Hegan Lane Business Partners Permit to Enter and Construct (PTEC), June 3 2014.
- 2) Excess spoils stockpile requirements on adjacent HLBP property.

APPENDIX D

- 1) California Water Service , Subdivider and Contractor Requirements for subdivider installation agreements, Form 1518 dated 11/14/02.
- 2) California Water Service, Approved Installing Contractors as of 8/30/12.
- 3) Developers cost Estimate form
- 4) CWS Rule 15 – Main Extensions, Form 1283 Rev. 8/08.

APPENDIX E

- 1) Central Valley Regional Water Quality Control Board 401 Permit (WDID# _____).

APPENDIX F

- 1) Bidders Question Form.

APPENDIX G

APPENDIX H

- 1) Federal Davis-Bacon Act Wage determination, effective as of 7/4/14.

END OF DOCUMENT

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes, but is not necessarily limited to, the furnishing and placing of cast-in-place concrete as indicated on the Drawings and specified herein.
- B. Related Sections include the following:
 - 1. Section 03 10 00, Concrete Forming & Accessories
 - 2. Section 03 20 00, Concrete Reinforcing

1.3 QUALITY ASSURANCE

- A. Coordination: The Contractor shall be responsible for installation of all accessories embedded in concrete etc. necessary for execution of the work of other trades. For holes larger than 6" diameter, contact engineer for review.
 - 1. Patching or cutting made necessary by failure or delay in complying with this requirement shall be at Contractor's expense.
- B. The Testing Agency shall not be affiliated with concrete supplier.
- C. Requirements of Regulatory Agencies:
 - 1. Perform work in accordance with codes and standards specified herein.
 - 2. "Special Inspection" of concrete is required per Chapter 17 of California Building Code (CBC) 2013 Edition, and shall be paid for by the Owner. Inspector shall also inspect installation of sill bolts, hold-down bolts and structural embed items.
 - 3. Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete as placed meets minimum requirements.
- D. Reference Standards:
 - 1. American Concrete Institute (ACI): (latest edition).
 - a. ACI 301, "Specification for Structural Concrete for Buildings."
 - b. ACI 304, "Recommended Practice for Measuring, Mixing, and Placing Concrete."
 - c. ACI 305, "Recommended Practice for Hot-Weather Concreting."
 - d. ACI 307, "Recommended Practice for Cold-Weather Concreting."
 - e. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - f. ACI 221, "Standard Practice for Selecting Proportions for Normal, Lightweight and Mass Concrete."
 - g. ACI 233R, "Ground Granulated Blast Furnace Slag as a Cementitious Constituent in Concrete."
 - 2. American Society for Testing and Materials.
 - 3. California Code (CBC) 2013 Edition.

1.4 SUBMITTALS

- A. Shop Drawings: Show construction joint and control joint locations for Architect's review.
- B. Test Reports: Submit "Special Inspection" reports of concrete compression, yields, air content, and slump test by Testing Laboratory to Owner, Architect, Contractor, and organization being tested or inspected.
- C. Certificates:
 - 1. Certified copies of mix designs for each concrete class specified, including compressive strength.
 - 2. Certification that materials meet requirements specified.
 - 3. Certification from vendor that samples originate from and are representative of each lot proposed for use.
 - 4. Testing Agency's certificate of compliance.
- D. Contractor shall submit concrete mix designs for each concrete class specified, including compressive strength, for the Architect's review and the Testing Agency's approval at least ten (10) working days before placing concrete. Architect's review is for general conformity with the requirements of the specifications but is not an approval of the mix proportions or components.
- E. Certificate of Conformance: Submit current certificate issued by the National Ready Mix Association for the ready-mix plant supplying concrete.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Insure storage facilities are weather tight and dry.
- B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
- C. Store coarse and fine aggregate in separate bins to prevent mixing and to preserve moisture content of aggregate at batching plant.
- D. Store bulk cement in covered bins.
- E. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General Requirements:

1. Cement and aggregates shall be from constant sources and shall have proven history of successful use with one another.
 2. Calcium chloride admixtures are not permitted.
 3. No frozen aggregates will be permitted.
 4. For shrinkage requirements, see General Notes Drawing.
- B. Cements: ASTM C150, Type II.
- C. Fly Ash: ASTM C618, Class F.
- D. Ground Granulated Blast Furnace Slag (GGBFS): ASTM C989, Grade 120.
- E. Normal Weight Aggregates: ASTM C33.
1. Coarse aggregate: Fine grain, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227.
 2. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested as per Test Method Calif. 217-E.
- F. Water: ASTM C94 and potable, free from impurities detrimental to concrete.
- G. Water-Reducing Admixtures: ASTM C494, Type A or Type D.
- H. Other admixtures: Only with prior written approval by Architect and Testing Agency.
- I. Non-shrink Grout: Premixed nonmetallic, non-staining grout requiring only addition of water at site.
- J. Curing Materials:
1. Curing Compounds: Clear, waterborne, membrane-forming compound complying with ASTM C309, Type 1, certified by the manufacturer to not impair bonding of floor covering.
 2. Absorptive Cover: Burlap cloth weighing approximately 9 oz. per sq. yd. and complying with AASHTO M182, Class 2.
 3. Moisture-retaining cover: One of the following complying with ASTM C171:
 - a. Polyethylene film
 - b. Polyethylene coated burlap

2.2 CONCRETE MIXES

- A. General:
1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of trial batch data or field test reports, in accordance with ACI 301. Design of all concrete mixes shall be provided by an independent testing laboratory or concrete technologist hired and paid for by the contractor.
 2. Mix designs shall be subject to review by Architect and by Testing Agency.
 3. Use water-reducing admixture in concrete as required for placement and workability.
 4. Introduction of calcium chloride admixtures will not be permitted.
 5. Unspecified admixtures will not be permitted unless specifically approved by Architect and by Testing Agency.

B. Concrete Classes:

Concrete Class and Location	Coarse Aggregate	Slump (± 1 in.)	Min. 28-day strength	Cementitious Materials		Max. water to binder ratio (C+S)
				Cement /cu. yd. (C)	SCM(i) /cu. yd (S).	
A. Foundation	1 in. max	5 in.	3000 psi	75%	25%	0.45
B. Suspended Slabs, Walls and Columns	1 in. max	4 in.	4000 psi	75%	25%	0.45
C. Fill on Metal Deck	1 in. max	4 in.	4000 psi	75%	25%	0.45
D. Slab-on-Grade subject to Vehicular Loading	1 in. max	4 in.	4000 psi	75%	25%	0.45
E. Slab-on-Grade not subject to Vehicular Loading	1 in. max	4 in.	3000 psi	75%	25%	0.45
F. Slab-on-Grade to be polished	1 in. max	4 in.	3500 psi	75%	25%	0.45

(i) SCM: Supplementary Cementitious Material – Fly Ash, Ground Granulated Blast Furnace Slag or a combination of both.

2.3 CONCRETE MIXING

- A. Ready Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and provide batch ticket information.
- B. Batching Plant Conditions: Ensure equipment and plant will provide accurate weighing, minimize segregation, and will efficiently handle materials to satisfaction of Architect and Testing Agency.
- C. Thoroughly clean concrete equipment before use to avoid contamination.
- D. Mix cement, fine and coarse aggregates, admixtures, and water to exact proportions of mix designs.
- E. Measure fine and coarse grain aggregates separately according to approved method which provides accurate control and checking.

- F. Maintain proportions, values, or factors of approved mixes throughout work.

PART 3 - EXECUTION

3.1 QUALITY CONTROL BY TESTING AGENCY

- A. Inspections:
 - 1. Construction of formwork is complete.
 - 2. Placement of required reinforcement, inserts, and embedded items is complete.
 - 3. Form ties at construction joints are tight.
 - 4. Areas to receive concrete are free of debris and excess water.
 - 5. Conveying equipment is clean and properly operating.
 - 6. The required design mix is provided.
 - 7. Concrete placement is performed in conformance with this Section.
 - 8. Curing is performed in conformance with this Section.
 - 9. Verification of concrete strength before form removal.
- B. Concrete Tests: Comply with ACI 301 and the following:
 - 1. Takes sets per governing code, and at a minimum take sets for every 100 cubic yards of concrete or fraction for each mix design used each day. Cylinders shall be site cured in molds for 7 days at 60 degrees F or above. Subsequent to that they can be transported for Lab curing.
 - 2. A total of five lab cured cylinders per set shall be tested as follows:
 - a. 1 at 7 days
 - b. 3 at 28 days
 - c. 1 as required by 28 day test results
 - 3. Strength of concrete mix will be acceptable if the average of three consecutive strength tests exceeds the specified compressive strength and none of the values is less than 500 psi below the specified strength.

3.2 PREPARATION

- A. Ensure availability of sufficient labor, equipment, and materials to place concrete correctly in accordance with schedule.
- B. Verify that formwork, reinforcement, and embeds are in place and inspected before placing concrete.
- C. Protect finished surfaces adjacent to areas to receive concrete.
- D. Provisions for Other Trades: Coordinate location of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete and make the necessary provisions for the placement of such embedded items.
- E. Construction Joints:
 - 1. Verify location and conformance with typical details; provide only where designated or as approved by Architect.
 - 2. Continue reinforcement across construction joint unless otherwise noted.
 - 3. Form keyed joints as indicated on the Drawings

4. Roughen construction-joint contact surfaces by sand-blasting to remove surface laitance and expose sound mortar and clean using compressed air.

F. Notify Architect and Special Inspector at least 48 hours before placing concrete.

3.3 PLACING

A. Do not add water to concrete during delivery, at the site, or during placement unless specifically approved by the Architect and Testing Agency.

B. Do not place concrete where sun, wind, heat, or facilities prevent proper finishing and curing.

C. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing. Place concrete as continuous operation to permit proper and thorough integration and to complete scheduled placement.

1. Deposit concrete in horizontal layers as necessary, avoiding free falls in excess of 6 ft.
2. Consolidate concrete in accordance with ACI 301 to ensure proper encasement of reinforcement, around embedded items and into corners.
3. Take precautions to avoid displacement of reinforcement and formwork.
4. Place concrete within 1 hour of adding water, unless otherwise specified.
5. Retempering of concrete which is partially set will not be permitted.

D. Consolidating:

1. Use mechanical vibrators for thorough consolidation of concrete.
2. Provide vibrators at each point of deposit during simultaneous placing to ensure timely consolidation; ensure availability of spare vibrators in case of failures.
3. Do not, place vibrators against reinforcement, attach to forms, or use to spread concrete.
4. For exposed concrete, vibrate with rubber-type heads and, in addition, spade along forms with flat strap or plate.

E. Walls and Other Formed Elements:

1. Placing procedures of concrete in forms that permit escape of mortar, or flow of concrete itself, will not be permitted.
2. Level top surface upon stopping work.
3. Space points of deposit to eliminate need for lateral flow.
4. Take special care to fill each part of forms by depositing concrete directly as near final position as possible.
5. Force concrete under and around reinforcement and embedded items without displacement.
6. After concrete has taken its initial set, exercise care to avoid jarring forms or placing strain on ends of projecting reinforcement.
7. Provide intermittent key indentations at all walls and a key indentation at each column.
8. Keep forms and reinforcement clean above placement line by removing clinging concrete with wire brush before placing next lift.

F. Interruption in placement lasting longer than 45 minutes shall be cause for discontinuing placement for remainder of day.

1. In this event, cut concrete back and provide construction joints as directed.

2. Clean forms and reinforcement as necessary to receive concrete at a later time.
- G. Hot-Weather Concreting: Conform to ACI 305 mean daily temperature rises above 90° F.
- H. Cold-Weather Concreting: Conform to ACI 306 when mean daily temperature falls below 40° F.

3.4 FINISHING

- A. Concrete non-metallic hardener: Shake applied, VOC compliant
 1. Basis of Design: W.R. Meadows, "GENFLOR" or approved equal
 2. Locations: Per FINISH SCHEDULE
 3. Color: As selected by architect from manufacturer's full range

3.5 CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Formed surfaces: Cure all formed surfaces including undersides of beams, supported slabs and similar surfaces by moist curing with forms in places. If forms are removed before end of curing period, continue curing for the remainder of the curing period.
 2. Unformed surfaces: Begin curing all unformed surfaces immediately after finishing.
 3. Start initial curing after placing of concrete and when free moisture has disappeared from concrete surface.
 4. Begin final curing procedures immediately following initial curing and before concrete has dried.
 5. Continue final curing for at least 7-days and in accordance with ACI 301.
 6. Avoid rapid drying at end of final curing period.
- B. HVFAC and SCC:
 1. Typically HVFAC and SCC exhibit little or no bleeding.
 2. Under ordinary conditions HVFAC and SCC may require 1 to 2 hours longer to set than ordinary concrete. Immediately after final set, it is essential to subject HVFAC and SCC to continuous moist curing for at least 7 days.
 3. Continue curing for an additional 21-days.
- C. Curing Method: Cure concrete in accordance with ACI 308.1 by one or combinations of the following methods:
 1. Moisture Curing: Keep surface of concrete continuously wet by one of the following:
 - a. Covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surfaces with specified absorptive cover, thoroughly saturating cover with water, and keeping absorptive cover continuously wet. Place absorptive cover with 12-inch lap over adjacent covers.
 2. Moisture-Cover Curing:
 - a. Cover concrete surfaces with moisture-retaining cover for the duration of curing, placed in the widest possible width, with sides and ends lapped at least 12-inch and sealed by waterproofing tape or adhesive.
 - b. Repair holes or tears during curing period using cover material and waterproof tape.
 3. Liquid Membrane Curing:

- a. Apply membrane-forming curing compound uniformly to damp concrete surfaces as soon as possible after final finishing operations are complete. Follow manufacturer's recommendations.
- b. Recoat areas which are subjected to heavy rainfall within 3-hours after initial application.
- c. Maintain continuity of coating and repair damage during curing period.
- d. Do not use membrane curing compounds on surfaces to receive floor coverings bonded to the concrete, liquid floor treatments, or other coating or finishing material applied directly to concrete, unless specifically approved by the Architect.

D. Temperature of Concrete during Curing:

1. When atmospheric temperature is 40°F. and below, cure in accordance with ACI 306.1, maintaining concrete temperature between 50°F. & 70°F. throughout curing period.
2. When necessary, arrange for heating, covering, insulation or housing required to maintain specified temperature and moisture conditions during the curing period.
3. When atmospheric temperature is 80°F. and above, cure in accordance with ACI 301.
4. When necessary, arrange for installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.
5. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F. in one hour, and 50°F. in 24-hour periods.

3.6 PROTECTION

- A. Protect concrete from injurious action of elements and defacement of any nature during construction operations.
- B. Protect exposed corners of concrete from traffic or use which will damage them in any way.
- C. Protect finished concrete surfaces from damage by subsequent construction operations.
- D. Make provisions to keep exposed concrete free from laitance caused by spillage or leaking forms or other contaminants.

3.7 MISCELLANEOUS CONCRETE ITEMS

A. Grouting Column Base Plates:

1. The grouting of steel base plates, specified under Section 05120 Structural Steel, shall be performed as specified herein as part of this section.
2. All grout used for the grouting of base plates shall be applied in strict accordance with manufacturer's directions.
3. All grouting of bases shall be carefully done to make sure that all voids between the base plates and the concrete are completely filled with non-shrink grout.

- B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on the Drawings.

- C. Modular Seals at Concrete Penetrations:
1. Basis of Design: Link-Seal, Model C with S-316 hardware, or approved equal
 2. Locations: Per MEP and Equipment Drawings

END OF SECTION 03 30 00

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 WORK NOT INCLUDED

- A. Cooperate with the other trades who may or may not be party to this Contract for the purpose of coordinating the electrical requirements and installation of equipment, materials, and furnishings provided by those other trades, including the Owner.

1.2 CODES AND STANDARDS

- A. Provide equipment and materials which conform to, and perform the installation thereof in accordance with the following codes and industry standards:
 1. California Electrical Code (CEC).
 2. National Electrical Code (NEC).
 3. Titles 8, 19 and 24 of the California Code of Regulations (CCR).
 4. National Fire Protection Association (NFPA)
 5. American National Standards Institute (ANSI).
 6. California State Fire Marshal (CSFM).
 7. California Fire Code (CFC)
 8. Underwriters' Laboratories (UL).
 9. Electrical Testing Laboratories Inc (ETL)
 10. National Electrical Contractors' Association (NECA).
 11. National Electrical Manufacturers' Association (NEMA).
 12. International Electrical Testing Association (NETA)
 13. Institute of Electrical and Electronics Engineers (IEEE).
 14. International Electrotechnical Commission (IEC)
 15. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 16. International Energy Conservation Code (IECC)
 17. National Electrical Safety Code (NESC) - Electrical Safety Orders
 18. Other applicable local codes and ordinances.
- B. Where the authority-having-jurisdiction makes an interpretation or decision, as is their prerogative in accordance with the Code, such direction shall be considered a part of these Contract Documents as if contained herein. With respect to completing the intent of the Contract Documents, comply with any and all requirements of the authority-having-jurisdiction and utility company field inspectors, at no additional cost.
- C. The above referenced codes and standards are considered to be absolute minimum requirements. Nothing in these Drawings or Specifications shall be construed to allow Work not conforming to the applicable codes and standards.

1.3 UTILITY FEES

- A. Pay utility company charges for normal or after hours shutdowns, service calls, repairs, and cable locating that are directly related to the installation of the Electrical Work.

1.4 WORKING SPACE

- A. Maintain adequate work space around, and access to, electrical and mechanical equipment in strict accordance with the applicable Codes. Verify during the course of construction that sufficient space will be available for the installation and maintenance of equipment, fixtures, etc.

1.5 MATERIALS AND SUBSTITUTIONS

- A. Specific trade names are used in the Drawings and Specifications in order to establish the standard grade and characteristics of said items. This does not imply the right upon the part of the Contractor to use other materials or methods without the approval of the Owner.
- B. Electrical materials and equipment shall bear the label of, or be listed by, the UL wherever standards have been established and label service is regularly furnished by that agency. Comply with the installation and application requirements of UL as documented in their published directories.
- C. Maintain uniformity throughout the Project by making use of only one make or brand of material for each material used.

1.6 SUBMITTALS

- A. Shop Drawings for equipment and materials as noted in each specification section. Bind the submittals as complete volumes according to classification of equipment such as power, lighting, fire alarm, etc. When possible, make all electrical submittals at the same time.
- B. Arrange panelboard submittals to show bussing, circuit numbering, and branch circuit protective devices similar to the schedules included in the contract documents. Show elevations of switchboards, motor control centers, and distribution centers indicating the layout of devices, meters, handles, etc. Provide device ratings, circuit numbers, and nameplate descriptions in table form. Include terminal strip mounting arrangements on elevations for terminal cabinets.

1.7 DRAWINGS AND SPECIFICATIONS

- A. The data and information contained on the Drawings is as accurate as was reasonably possible at the time they were produced, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc., will be dictated by the actual building and the conditions at the Site.
- B. The layout of electrical equipment, wiring, and accessories is shown in a diagrammatic fashion (not pictorially) in order to achieve clarity and legibility. Although the size and location of electrical equipment is drawn to scale wherever possible, refer to all data in the Contract Documents and field verify this information as the project progresses. Examine architectural, structural, mechanical, and other drawings to determine the exact location of conduits, outlets, fixtures, and equipment and to note any conditions which may affect the electrical Work.
- C. Because the Electrical Drawings may be distorted for clarity of representation, it may be necessary to field verify the exact location of electrical outlets, lights, switches, etc. in order to conform to the architectural elements. The Owner reserves the right to make minor changes to the locations of equipment, devices, and wiring shown, at no additional cost, providing the changes are ordered

before the rough-in of conduit, boxes, or related items is completed, and no extra material are required.

- D. Conduit quantities, sizes, termination points, and wiring are indicated. However, not all conduit bends or routing details are indicated. Route conduit so as to conform to the structural conditions, avoid obstructing other trades, maintain space restrictions and keep circulation areas and access openings clear.

1.8 WORKMANSHIP

- A. Constantly supervise the work personally or through an authorized and competent representative. Keep the same foreman or supervisor on the project from commencement through completion.
- B. All electrical work shall be supervised by an Electrician with a minimum of 10 years of experience on comparable projects or tasks.

1.9 MANUFACTURER'S DIRECTIONS

- A. Adhere to the manufacturer's directions regarding the proper installation and configuration of electrical equipment where those directions cover points not included in these Drawings and Specifications.

1.10 PROTECTION AND STORAGE

- A. Deliver electrical materials to the Site new, and in unbroken packages. Protect electrical equipment and materials during transit, storage and handling to prevent damage, soiling and deterioration.
- B. During shipping storage and handling protect electrical materials from damage of any type including dust, water, over-spray, and temperature. Avoid damage during construction to the Work and materials of other trades as well as the electrical Work and material. Repair or replace, at the Contractor's expense, defective or damaged items such that the entire Work is completed in a condition satisfactory to the Owner.

1.11 EXCAVATION, CUTTING, PATCHING, AND REPAIR

- A. Perform excavation and backfill required for the installation of electrical sub-structures. Restore grounds, walkways, roadways, curbs, walls, and other existing underground facilities to their original condition.
- B. Cut, core-drill, and demolish existing walls, floors, ceilings and other building surfaces as required for the installation of Electrical Work. Obtain the approval of the Owner prior to performing any operation which may affect any structural elements of the building.
- C. Patch and repair wood, plaster, tile, or concrete surfaces which have been damaged by the installation of the Electrical Work so that the finished surface matches the surrounding conditions.

1.12 FLASHING, WATERPROOFING AND SEALING

- A. In general, install in an approved watertight manner, Electrical Work which pierces exterior walls or waterproofing membranes. Flash and counter-flash roof and wall penetrations in a manner described in other applicable sections of this Specification and as approved by the Owner.
- B. Fit conduits passing through finished walls with steel escutcheon plates of brass, chrome, or painted finish as directed by the Owner. Grout penetrations of floor slabs, concrete or masonry walls with an approved grout or silicone elastomeric caulk.

1.13 CLEANING, ADJUSTING, AND TOUCH-UP

- A. Remove on a daily basis electrical debris, scraps, packaging material and other rubbish. Dispose of such items off-site in an approved manner and debris. Maintain the site free from physical hazards at all times in accordance with OSHA regulations.
- B. After installation, completely clean electrical equipment, fixtures, and materials of excess paint, over-spray, plaster, cement, insulating products, and other foreign matter. Leave the Electrical Work in a clean, finished, dry, level, like new condition.
- C. Touch-up paint scratches and scuffs on electrical equipment and lighting fixtures with paint recommended by the manufacturer and matching the original item finish.
- D. Make setting, adjustments, and programming in accordance with the manufactures' operating and installation instructions. Settings and program variables will be issued by the Owner prior to commissioning of the electrical system.

1.14 INSPECTIONS AND TESTING

- A. Arrange for the inspection of the Work at various stages of completion by the authority having jurisdiction, utility company representatives, and the Owner. Comply with all directions and remedial measures issued thereby. Any objections to these orders on the part of the Contractor must be presented to the Owner in writing within forty eight (48) hours of the inspection report.
- B. Coordinate the installation of the Work so that observation of all rough-in, concealed, or underground Work can take place by the Owner.
- C. Coordinate the provision of all Utility substructures, including but not limited to concrete pads, concrete pull and junction boxes, conduit, pull ropes, trenching, bedding, backfill, warning / locating tape, and associated accessories with Utility requirements. Coordinate all Utility inspections according to Utility requirements. Obtain Utility acceptance of substructures in writing prior to closing Utility trenches. Costs associated with opening trenches that have not been accepted by the Utility shall be the responsibility of the Contractor.
- D. Perform tests of the electrical system during the course of the project and at project completion to ensure safe and proper function in accordance with the Contract Documents, manufacturers' recommendations, and applicable codes. Testing shall include, but not necessarily be limited to, the following:

1. Test for short circuits, open circuits, neutral leakage, and improper grounds on feeders and branch circuits. Perform this test with mains disconnected from feeders, branch circuits closed, fixtures and devices permanently connected, lamps removed from sockets and wall switches closed.
 2. Test for proper phase-to-phase and phase-to-neutral operating voltage on the main service and on each separately derived system. Perform this test at full load and at no load. With all circuits at full operating conditions, test the phase and neutral load currents using a clamp-on ammeter.
 3. Tests as required by other sections of these Specifications.
 4. Tests as prescribed by individual equipment manufacturers whether or not described in these Specifications.
- E. Demonstrate to the Owner that the entire installation is complete, in proper operation condition. Activate all circuits, lights, devices, and controls under full load and normal operating conditions. Identify faulty items and immediately replace or repair defective equipment, workmanship, and materials to like new condition and retest in the presence of the Owner.
- F. Demonstrate to the Owner that the entire electrical system is free from short circuits and improper grounds, or upon request of the Owner anytime, make necessary tests under the observation of the Owner which will ensure that electrical equipment, materials and installation methods are as specified.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 26 05 00

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SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes building wire and cable, service entrance cable, control cables, wiring connectors and connections.
- B. All power and lighting circuit wiring and lighting control cables shall be installed in conduit.
- C. Wiring for auxiliary electrical systems such as fire alarm, security, telecommunications/data, and other similar systems shall be installed in conduit unless specifically noted otherwise in the drawings.
- D. Feeder conductors 2 AWG and larger shall be aluminum and all bus lugs, connectors, splices, and accessories shall be listed for use with aluminum conductors.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ASTM B 3 Soft or Annealed Copper Wire
- B. ASTM B 496 Compact Round Concentric-Lay-Stranded Copper Conductors
- C. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- D. ASTM B 801 Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation
- E. ANSI C 2 National Electrical Safety Code – latest edition
- F. IEEE 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- G. IEEE 399 Recommend Practice for Industrial and Commercial Power System Analysis.
- H. NECA (National Electrical Contractors Association) - Standard of Installation.
- I. NEMA WC-26 Wire and Cable Packaging
- J. NETA ATS National Electrical Testing Association Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- K. NFPA 70 NEC.
- L. UL 83 Thermoplastic-Insulated Wires and Cables.
- M. UL 486A-486B Wire Connectors.

N. UL 510 Polyvinyl Chloride, Polyethylene and Rubber Insulating Tapes.

1.3 SYSTEM DESCRIPTION

- A. The applications for required cable, wire, and connectors include, but are not limited to:
1. Power distribution circuitry.
 2. Lighting circuitry.
 3. Appliance and equipment circuitry.
 4. Wiring for motors of mechanical equipment
 5. Wiring from the motor(s) of mechanical equipment to the disconnect switches or junction boxes, including wiring for pushbuttons, pilot lights, interlocks and similar devices as directed, shown, or specified.
 6. Wiring from the motors of mechanical equipment to motor starters, including other auxiliary wiring as may be required, directed, or shown.
 7. Line voltage wiring as required by other Disciplines, and interlocking to motor starters.
 8. Control wiring for motors, mechanical equipment, relays and switches, and similar mechanical-electrical devices.
 9. Line voltage wiring to thermostats, alarm system components, security system components and other miscellaneous equipment.

1.4 PROJECT CONDITIONS

- A. All lighting and branch circuit wiring shall be minimum No. 12 AWG copper conductor unless otherwise indicated.
- B. All building and large equipment feeder circuits shall be minimum No. 2 AWG Aluminum conductor unless otherwise noted
- C. Wire and cable routing indicated is diagrammatic unless dimensioned. Route wire and cable as required to complement project conditions.
- D. The Contractor shall be responsible for all raceways and raceway/cable supports in accordance with all other sections of these Specifications.

1.5 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by UL, ETL, or other recognized, acceptable testing and listing agencies as suitable for the purpose specified and shown.

1.6 CONTRACTOR SUBMITTALS

- A. Product Data:
1. Submit manufacturer's catalog cuts and technical data for building wire and cables.
- B. Field Test Report:
1. Measure overall insulation resistance to ground for all conductors #2 AWG and larger. Provide test report with measured values.

1.7 CLOSEOUT SUBMITTALS

- A. Submit final certified test reports of all insulation resistance tests.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.
- B. Store and protect cable and accessories from the environment in accordance with manufacturer's published instructions. Provide adequate heating and ventilation to prevent condensation.
- C. Damaged items shall be replaced at no additional cost to Owner.

1.9 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 feet of length shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Building Wire and Cable
 1. Southwire Co.
 2. Cerrowire
 3. General Cable Corp.
 4. Okonite Co.
 5. Approved Equal.

2.2 BUILDING WIRE AND CABLE

- A. Lighting and branch circuit wire and cable shall be UL83 compliant, insulated, single conductor, copper, solid or stranded, rated for 600-volts AC. The insulation shall be rated for 90 degrees Celsius, THW, THHN/THWN-2, RHW or XHHW, per ANSI/NFPA 70.
- B. Feeder wire and cable #2 AWG and larger shall be UL83 compliant, insulated, single conductor, aluminum, compact stranded, AA-8000 series alloy, rated for 600-volts AC. The insulation shall be rated for 90 degrees Celsius, THHN/THWN-2 or XHHW, per ANSI/NFPA 70.
- C. For Interior Dry Location: Use only building wire, THHN/THWN insulation rated 90 degree Celsius, in raceway.
- D. For Exterior Wet or Dry Locations: Use XHHW-2 or THHN/THWN-2 insulation rated for 90 degree Celsius, in raceway.

- E. For Underground Dry or Wet Locations: Use XHHW-2 or THHN/THWN-2 insulation rated 90 degree Celsius, in raceway.
- F. For connections to electrical equipment, coordinate wire type with equipment manufacturer.

2.3 WIRING CONNECTORS

- A. Split Bolt Connectors:
 - 1. Burndy LLC.
 - 2. Cooper Crouse Hinds.
 - 3. O.Z./Gedney Co.
 - 4. Thomas & Betts Co.
 - 5. 3-M Co.
 - 6. Or Approved Equal.
- B. Solderless Pressure Connectors:
 - 1. Burndy LLC.
 - 2. Ideal Industries Co.
 - 3. Thomas & Betts Co.
 - 4. 3-M Co.
 - 5. Or Approved Equal.
- C. Spring Wire Connectors:
 - 1. Ideal Industries Co.
 - 2. 3-M Co.
 - 3. Or Approved Equal.
- D. Compression Connectors:
 - 1. Burndy LLC.
 - 2. Thomas & Betts Co.
 - 3. 3-M Co.
 - 4. Or Approved Equal.

2.4 WIRE COLOR CODE

- A. Color-code all conductors:
 - 1. Wire sizes No. 10 AWG and smaller shall have integral color-coded insulation.
 - 2. Wire sizes No. 8 AWG and larger may have black insulation but shall be identified by color-coded electrical tape at all junction, splice, pull, or termination points. Integral color coded insulation is also acceptable.
 - 3. Color tape shall be applied to at least 3 inches of the conductor at the termination ends and in junction or pull boxes or where readily accessible.
 - 4. Conductors for all systems shall not change color at splice points.
 - 5. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit.
 - 6. For No. 4 AWG and larger ground conductors, identify with green tape at both ends and all visible points, included in all junction boxes.
- B. Each phase wire shall be uniquely color-coded as indicated below:

1. 120/240-Volts
 - a. Phase A – Black
 - b. Phase B – Red
 - c. Neutral - White
 - d. Ground - Green
2. 120/208-Volts
 - a. Phase A – Black
 - b. Phase B – Red
 - c. Phase C – Blue
 - d. Neutral – White
 - e. Ground – Green
3. 277/480-Volts
 - a. Phase A - Brown
 - b. Phase B - Orange
 - c. Phase C – Yellow
 - d. Neutral - White or Natural Gray
 - e. Ground – Green
4. Isolated Grounds: Green with Yellow Stripes

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.
- C. Verify that raceway installation is complete and supported as required by the specifications.

3.2 PREPARATION

- A. Test raceway with a mandrel and thoroughly swab out to remove foreign material before pulling cables.
- B. For conduits sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel.
- C. For conduits sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. Then draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel.

3.3 EXISTING WORK

- A. Disconnect and remove exposed and/or abandoned wire and cable. Patch surfaces where removed cable pass through building finishes.
- B. Disconnect abandoned circuits and remove wire and cable. Remove abandoned boxes if wire and cable servicing them is abandoned and/or removed. Provide blank cover for abandoned boxes that are not removed.

- C. Ensure access to existing wiring connections which remain active and which require access. Modify installation or provide access panel as appropriate.
- D. Extend existing circuits using materials and methods and compatible with existing electrical installations, or as otherwise specified.
- E. Tag and repair existing wire and cable that remain or are being reused.

3.4 INSTALLATION

A. General:

1. Install wire and cable in accordance with manufacturer's instructions and NECA "Standard of Installation."
2. Route wire and cable as required to meet project conditions.
3. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
4. Protect exposed cable from damage.
5. Pull all conductors into raceway at same time.
6. Unless specifically prohibited by manufacturer installation instructions, use suitable wire pulling lubricant for building wire No. 4 AWG and larger. Lubricant shall not be deleterious to the cable sheath, jacket or outer covering.
7. Do not exceed cable manufacturer's recommended pulling tension limits when installing wire or cable.
8. Support cables above accessible ceiling using standard support methods to support cables from structure. Do not rest cable on ceiling panels.
9. Neatly train and lace wiring inside boxes, equipment, and panelboards

B. Cable and Wire Size:

1. Conductor sizes are based on copper unless specifically indicated as aluminum or "AL".
2. Use conductor no smaller than No. 12 AWG for power and lighting circuits.
3. Use conductor no smaller than No. 14 AWG for control circuits.
4. Use stranded conductor for all feeders, branch and control circuits.

C. Cable Identification

1. Identify all wires and cables as specified in other sections of these Specifications.

D. Special Techniques - Wiring Connections:

1. Use connectors listed for the wire material, size and insulation type.
2. Clean conductor surfaces before installing lugs and connectors. Where an anti-oxidation lubricant is used, apply liberally, coating all exposed conductor surfaces.
3. Use suitable cable fittings and connectors.
4. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
5. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.
6. Tape un-insulated conductors and connector with two layers of half-lapped rubber insulating compound tape and two layers of half-lapped, 7-mil electrical tape, Scotch 33+, or approved equal.

7. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.
8. Stranded conductors for control circuits shall have ring terminals crimped on for all device terminations. Bare stranded conductors shall not be placed directly under the screws.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and test shall be performed under provisions of NETA ATS section 7.3 (2) - Low Voltage Cables, 600-Volt Maximum as follows.
 1. Visual and Mechanical Inspection:
 - a. Compare cable data with drawings and specifications.
 - b. Inspect exposed sections of cable for physical damage and correct connection in accordance with single-line diagram.
 - c. Inspect all bolted electrical connections for high resistance using one of the following methods:
 - 1) Use of low-resistance ohm-meter in accordance with NETA section 7.3.2.2 (Electrical Tests).
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data from NETA ATS Table 10.12.
 - d. Inspect compression-applied connectors for correct cable match and indentation.
 - e. Verify cable color coding with applicable specifications and National Electrical Code.
 2. Electrical Tests
 - a. Perform insulation-resistance test on each #4 AWG or larger conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute.
 - b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable, in accordance with Section 7.3.2.1 (Visual and Mechanical Inspection).
 - c. Perform continuity test to insure correct cable connection.
 - d. Correct malfunctions and/or deficiencies immediately as detected at no additional cost to the Owner, including additional verification testing.
 - e. Subsequent to final wire and cable terminations, energize all circuitry and demonstrate functional adequacy in accordance with system requirements.
 3. Test Values
 - a. Compare bolted connection resistance to values of similar connections.
 - b. Bolt-torque levels should be in accordance with NETA ATS unless otherwise specified by the manufacturer.
 - c. Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
 - d. Investigation shall include (but not be limited to): breaking splices in the cable and re-testing individual lengths, identifying lengths that are not achieving required test values, repairing or replacing those lengths, and remaking splices. Once the complete assembly tests within the required deviation, the investigation will be considered complete. Document all test procedures and results for review by the Engineer.

- e. Minimum insulation-resistance values should not be less than 50 meg-ohms.

END OF SECTION 26 05 19

SECTION 26 22 00 – LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Two-winding transformers – provision of single-phase and three-phase general purpose, individually mounted, dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as indicated on the drawings.

1.2 REFERENCE STANDARDS

A. ANSI C57.96 Guide for Loading Dry-Type Distribution and Power Transformers

B. National Electrical Manufacturers Association:

1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
2. NEMA ST 20 - Dry Type Transformers for General Applications.
3. NEMA TP-1 - Guide for Determining Energy Efficiency for Distribution Transformers

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 DESIGN REQUIREMENTS

A. Transformers shall be designed, manufactured, and tested in accordance with the latest applicable ANSI, NEMA and IEEE standards. All 600-volt class transformers 2 kVA through 750 kVA shall be UL listed and bear the UL label.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

C. Transformer shall be energy efficient type, meeting the requirements of NEMA TP 1.

1.4 SUBMITTALS

A. Product Data:

1. Outline and support point dimensions of enclosures and accessories.
2. Unit weight, voltage, kVA, and impedance ratings and characteristics.
3. Tap configurations, insulation system type, and rated temperature rise.
4. Winding configuration.
5. Terminations / Connection points.

B. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

- C. Manufacturer's Instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- D. Submit calculations and anchoring methods (anchor bolt size, embedment and assembly details) to meet California Seismic Zone IV requirements.
- E. Manufacturer's Certification and Test Reports:
 - 1. Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level. Factory test data on a prototypical unit of identical size and features is acceptable.
 - 2. Manufacturer's Certificate. Certify that products meet or exceed specified requirements.
- F. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Record Documentation: Record actual locations of transformers.
- B. Operation and Maintenance Manual.
- C. Field Test Report

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver transformers individually wrapped for protection and mounted on shipping skids.
- B. Inspect transformers as they arrive on site for damage and immediately report any damage discovered to the Owner and the Engineer.
- C. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

- A. The transformers shall be as manufactured by one of the following manufacturers:
 - 1. General Electric Co.
 - 2. Cutler-Hammer.
 - 3. Square D Co.
 - 4. Or Approved equal

2.2 STANDARD DRY-TYPE TRANSFORMERS

- A. Transformers shall be NEMA ST-20 Class AA dry-type, voltage, phase, kVA rating, and method of mounting as indicated in the drawings. All three-phase transformers shall have three-winding primaries and three-winding secondary.
- B. Insulation System
 - 1. Transformers shall be insulated as follows:
 - a. 2-kVA and below - 150 degrees C insulation system.
 - b. 3 through 30 kVA - 180 degrees C insulation system.
 - c. 45-kVA and above - 220 degrees C insulation system.
 - 2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40°C maximum ambient, with a 30°C average over 24 hours.
 - 3. All insulation material shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.
 - 4. Transformers 30 kVA through 225 kVA shall be 115° C temperature rise above 40° C ambient. 115° C rise transformers shall be capable of carrying a 15 percent continuous overload without exceeding 150° C rise in a 40°C ambient.
 - 5. Transformers rated 300 kVA through 500 kVA shall be 80° C temperature rise above 40° C ambient. 80° C rise transformers shall be capable of carrying a 30 percent continuous overload without exceeding a 150° C rise in a 40° C ambient.
 - 6. Limit transformer surface temperature rise to maximum of 50 degrees C.
- C. Core and Coil Assemblies
 - 1. Transformer core shall be constructed with high grade, non-aging, grain-oriented silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point.
 - 2. The transformer core volume shall allow sufficient transformer operation at 10 percent above the highest tap voltage.
 - 3. The core laminations shall be tightly clamped and compressed.
 - 4. Coils shall be wound of electrical grade copper or aluminum with continuous wound construction, terminations brazed or welded.
 - 5. On units rated below 3 kVA, the core and coil assembly shall be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moisture proof, shock resistant seal. The core and coil encapsulation system shall minimize the sound level.
 - 6. On units rated 3 kVA and above, the core and coil assembly shall be impregnated with non-hygroscopic, thermosetting varnish and cured to reduce hot spots and seal out moisture. The assembly shall be installed on vibration-absorbing pads.
- D. Taps
 - 1. For transformers rated 25 kVA and larger, provide primary windings with 6 taps; two 2-1/2 % increments above full-rated voltage and four 2-1/2 % increments below full-rated voltage.
 - 2. For transformers rated below 25 kVA, provide two taps at 5 percent below full rated voltage...
- E. Provide terminal enclosure, with screw cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector.

1. Provide terminal board with mechanical compression type connectors. Limit terminal compartment temperature to 75° C when transformer is operating continuously at rated load with ambient temperature of 40° C.
2. Provide wiring connections suitable for stranded copper wiring, rated 75° C, and loaded to the 75° C ampacity.

F. Basic Impulse Level

1. 10-kV for transformers less than 300-kVA
2. 30-kV for transformers 300-kVA and larger.

G. Grounding

1. Ground core and coil assembly to enclosure by means of a visible flexible copper-grounding strap. Provide grounding in accordance with these Specifications.

H. Enclosure

1. The enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed, and finished with ANSI 61 color weather-resistant enamel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90° C. The core of the transformer shall be grounded to the enclosure.
2. On units rated below 3 kVA, encapsulated, the enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes as required.
3. On units rated 3 kVA and above, the enclosure construction shall be ventilated NEMA 1 suitable for indoor use, with lifting lugs as required. All ventilation openings shall be protected against falling dirt and water
4. On outdoor units, the enclosure shall be ventilated, NEMA 3R suitable for outdoor use, with weather shields over ventilation openings.

I. Nameplate

1. Provide Manufacturer's nameplate that includes transformer kVA, primary and secondary voltage, impedance, temperature rating, winding connection data, and overload capacity based on rated allowable temperature rise.

J. Sound Level

1. Transformer sound levels shall be per NEMA ST 20 Table 3-9, as follows:

EQUIVALENT TWO-WINDING KVA	AVERAGE SOUND LEVEL IN DECIBELS	
	1.2 KV OR LESS	ABOVE 1.2 KV
1 – 9	40 db	45 db
10 – 50	45 db	50 db
51 – 150	50 db	55 db
151 - 300	55 db	58 db
301 - 500	60 db	60 db
501 - 700	62 db	62 db

701 – 1,000	64 db	64 db
1,001 – 2,000	66 db	66 db
2,001 – 3,000	68 db	68 db

2.3 SOURCE QUALITY CONTROL

- A. The following factory test results shall be provided for each transformer:
1. Ratio tests at the rated voltage connection and at all tap connections
 2. Polarity and phase relation tests on the rated voltage
 3. Applied potential tests
 4. Induced potential test
 5. No-load and excitation current at rated voltage on the rated voltage connection.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify mounting supports are properly sized and located including concealed bracing in walls.
- B. Provide concrete housekeeping pad for mounting and leveling of the transformer.

3.2 INSTALLATION

- A. Install transformer(s) in accordance with manufacturer's instructions.
- B. Set transformer plumb and level.
- C. Use flexible conduit, in accordance with Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- D. Support transformers in accordance with NEC requirements.
1. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer.
 2. Mount floor-mounted transformers on vibration isolating pads suitable for isolating transformer noise from building structure.
 3. Mount trapeze-mounted transformers as indicated on Drawings.
 4. Provide seismic restraints.
- E. Install grounding and bonding in accordance with Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS as outlined below:
1. Dry Type Air-Cooled Transformers, 600 Volt and Below (167-kVA Single-Phase, 500-kVA Three-Phase, and smaller).
 - a. Visual and Mechanical Inspections

- 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical, electrical and mechanical condition.
 - 3) Verify that resilient mounts are free and that any shipping brackets have been removed.
 - 4) Inspect all bolted electrical connections for high resistance using one of the following methods:
 - a) Use of low-resistance ohm meter in accordance with NETA ATS Section 7.2.1.1.2 (Electrical Tests).
 - b) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 10.12.
- b. Electrical Tests
- 1) Perform resistance measurements through all bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.2.1.1.1 (Visual and Mechanical Inspection).
 - 2) Perform insulation-resistance tests winding-to-winding and each winding-to-ground with test voltage in accordance with NETA ATS Table 10.5.
 - 3) Perform turns ratio tests at all tap positions.
 - 4) Verify that as-left tap connections are as specified.
- c. Test Values
- 1) Compare bolted connection resistances to values of similar connections.
 - 2) Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by manufacturer.
 - 3) Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values that deviate from similar connections by more than 50 percent of the lowest value.
 - 4) Insulation-resistance test values at one minute should not be less than the values calculated in accordance with the formula in NETA ATS Table 10.5. Results shall be temperature corrected in accordance with NETA ATS Table 10.14.
 - 5) Turns-ratio test results should not deviate more than one-half percent from either the adjacent coils or the calculated ratio.
 - 6) In the event that a transformer fails any of the above testing, and repairs/corrections cannot be made in the field while maintaining all appropriate product listings, replace the transformer at no cost to the owner with a new unit and repeat the testing.

B. Energize primary circuit at rated voltage and frequency from normal power source and test transformer, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance otherwise, remove and replace with new units and proceed with re-testing.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

3.5 CLEANING

- A. Remove grease, spilled/splashed paint, and wipe transformer down prior to final punch walk.

END OF SECTION 26 22 00

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution and branch circuit panelboards and circuit breakers.

1.2 REFERENCES - CODES AND STANDARDS

- A. ANSI C2 - National Electrical Safety Code.
- B. NECA - Standard of Installation
- C. NEMA AB 1 - Molded Case Circuit Breakers.
- D. NEMA ICS 6 - Enclosures
- E. NEMA PB 1 - Panelboards.
- F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- G. NETA ATS - (National Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
- H. NFPA 70 - NEC

1.3 SUBMITTALS

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- B. Product Data: Submit catalog data showing specified features of standard products.
- C. Test Report:
 - 1. Factory Tests:
 - a. Certified factory test reports shall be submitted for manufacturer performed routine factory tests, including tests required by standards listed in Section 1.2. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in Section 3.3 shall be included.
- D. Installation, Operation, and Maintenance Manuals: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.4 EXTRA MATERIALS

- A. Furnish two (2) of each panel board key. Panelboards keyed alike to Owner's current keying system.

PART 2 - PRODUCTS

2.1 DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS

- A. Manufacturers:
 - 1. General Electric Co.
 - 2. Cutler-Hammer.
 - 3. Square D Co.
 - 4. Siemens
 - 5. Or Approved equal
- B. Product Description
 - 1. NEMA PB 1, circuit breaker type distribution, lighting and appliance branch circuit panelboard.
- C. Service Conditions:
 - 1. Temperature: 104 degrees F (40 degrees C) ambient
 - 2. Altitude: 100 feet (35 m) above sea level.
- D. Panelboard Bus
 - 1. Tin plated copper current carrying components, ratings as indicated on drawings.
 - 2. Main bus ampacity shall be equal to the main circuit breaker frame size rating unless otherwise noted on the drawings.
 - 3. Furnish copper ground bus in each panelboard.
- E. Minimum integrated short circuit rating
 - 1. Panelboards rated 240-Volts - 10,000 amperes RMS symmetrical
 - 2. Panelboards rated 480-Volts - 35,000 amperes RMS symmetrical
 - 3. Circuit Breaker rating shall match or exceed the panel interrupting rating
 - 4. Series rated circuit breakers are not acceptable
- F. Enclosure:
 - 1. Indoor Installation
 - a. NEMA PB 1, Type 1, gasketed, steel construction, minimum 6 inches deep, 20 inches wide suitable for flush or surface mounting as indicated on drawings.
 - b. Flush or surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.
 - c. Fully hinged door with flush lock and metal directory frame.
 - d. Finished in manufacturer's standard gray enamel (ANSI 61).
 - 2. Outdoor Installation
 - a. Panel shall be housed inside an outer weatherproof, NEMA 3R enclosure constructed as follows:
 - b. Steel support frame with body stiffeners for added strength and minimum 12 gauge panels all around.
 - c. Steel panels shall have seams that are continuously welded and ground smooth with no holes or knockouts.
 - d. The outer door shall provide two-door protection, isolation of electrical equipment and easy access to the interior section doors and devices.

- e. Provide rolled lip around three sides of each outer door and along the top of enclosure opening to channel away liquids and contaminants.
- f. Provide oil-resistant door gasket attached with oil resistant adhesive and held in place with steel retaining strips.
- g. Provide heavy gauge steel continuous piano hinged, 3-point latch, hasp and staple for pad-locking.
- h. Provide continuous external support channels for floor mounting, leveling and anchoring the assembly.
- i. Provide heavy duty removable lifting angles and/or lugs.
- j. Provide suitable grounding stud on door and body.
- k. Provide adequate cable entry space and conduit fittings approved for NEMA Type 3R enclosure for top or bottom conduit entry as indicated on the drawings.
- l. Provide space heaters with thermostat control in each section to prevent condensation.

2.2 MOLDED CASE CIRCUIT BREAKERS

- A. NEMA AB 1, bolt-on type thermal magnetic and instantaneous magnetic trip circuit breaker. Circuit breaker thermal elements shall be of the bimetallic type and shall be capable of withstanding sustained overload and short-circuit currents without injury and without affecting the calibration of the bimetallic element. The thermal element shall have inverse time characteristics. The instantaneous elements shall trip the circuit breaker at the minimum standard trip setting.
- B. Provide common trip handle for multiple pole circuit breakers.
- C. Provide type SWD for lighting circuits and type HACR circuit breakers for air conditioning equipment circuits.
- D. Provide Class A ground fault interrupter circuit breakers as indicated on drawings.
- E. Trip rating shall be as indicated on drawings.
- F. Minimum integrated short circuit rating shall match panelboard rating. Series ratings are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA "Standard of Installation", NFPA 70 and IEEE C2.
- B. Install panelboards plumb.
- C. Install recessed panelboards flush with wall finishes.
- D. Mounting height: 6 feet to top of panelboard. Install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- E. Install filler plates for unused spaces in panelboards.

- F. Provide typed circuit directory for each panelboard. Revise directory to reflect circuiting changes to balance phase loads.
- G. Install engraved plastic nameplates in accordance with these Specifications.
- H. Ground and bond panelboard enclosure according to these Specifications. Connect equipment ground bars of panels in accordance with NEC.

3.2 FIELD QUALITY CONTROL

- A. Field Inspect and testing shall be in performer under the provisions of NETA ATS 7.6 (1) (1) – Circuit Breaker, Low Voltage, Insulated Case/Molded Case, as outlined below:
 - 1. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with drawings and specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect circuit breaker for correct mounting.
 - d. Operate circuit breaker to insure smooth operation.
 - e. Inspect case for cracks or other defects.
 - f. Verify appropriate anchorage, required area clearances, physical damage, and correct alignment.
 - g. Inspect all doors, panels, and sections for corrosion, dents, scratches, fit, and missing hardware.
 - h. Verify that fuse and/or circuit breaker sizes and types correspond to drawings.
 - i. Perform circuit breaker inspections and operation test.

3.3 ADJUSTING

- A. Rearrange circuits in panelboard to balance phase loads to within 20 percent of each other.
- B. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

SECTION 26 32 13 – ENGINE GENERATORS (Add Alternate #1)

PART 1 - GENERAL

1.1 SUMMARY

- A. NOTE: The (2) generators, including enclosures and sub-base fuel tanks, feeder wiring, accessory and control circuit wiring, concrete pad, and a portion of the conduits associated with the wiring are all to be bid as a part of Add Alternate #1. Refer to the site plans for the extent of substructures included in the Base Bid. The Automatic Transfer switch and associated feeders are included in the Base Bid

- B. Section includes equipment and services necessary for the design, manufacture, factory testing, installation, and site testing of a complete and operable on-site emergency generator unit including radiator, exhaust silencer, double-contained fuel piping, sub-base fuel tank, leak-detection system, control panel, battery and charger enclosed in an outdoor weatherproof, sound attenuated (70dB), rodent resistant enclosure with a marine-grade finish.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. The standards referenced herein, except as modified in the Contract Documents, shall have full force and effect as though included in these Specifications. These standards are not furnished to by the Engineer since manufacturers and trades involved are assumed to be familiar with these requirements. The Contractor and/or Installer shall obtain copies of reference standards direct from publication sources as needed for proper performance and completion of the work. General codes, such as the National and State Electric Codes, Building Codes, and Fire Codes are to be followed without specific reference in these specifications.
 - 1. IEC 8528 Control Systems for Generator Sets - Part 4.
 - 2. IEC Standards 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
 - 3. IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 4. IEEE 587 Voltage surge resistance.
 - 5. NEMA AB 1 Molded Case Circuit Breakers.
 - 6. NEMA ICS 10 AC Generator sets, Industrial Control and Systems: AC Transfer Switch Equipment.
 - 7. NEMA MG 1 Motors and Generators.
 - 8. NEMA 250 Enclosures for Electrical Equipment (1,000 Volts Maximum.)
 - 9. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
 - 10. NFPA 30 Flammable and Combustible Liquids Code.
 - 11. NFPA 70 National Electrical Code, 2005 Edition (2007 California Electrical Code).
 - 12. NFPA 110 Emergency and Standby Power Systems.
 - 13. CFC California Fire Code, 2010 Edition
 - 14. SFFC San Francisco Fire Code, 2010 Edition
 - 15. UL 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.
 - 16. UL 508 Standard for Industrial Control Equipment
 - 17. UL 2200 Standards for Stationary Engine Generator Assemblies

1.3 SUBMITTALS

A. Shop Drawings:

1. Electrical characteristics and connection requirements.
2. Plan and elevation views of unit including overall dimensions.
3. Electrical and Fuel Oil piping interconnection point with dimensions.
4. Fuel consumption rate curves at various loads.
5. Ventilation and combustion air requirements.
6. Electrical schematic and interconnection diagrams.
7. Sub-base fuel tank details and dimensions.
8. Overall unit dimensions and seismic anchoring points with dimensions.
9. Enclosure sound rating.
10. Emissions report.

B. Product Data:

1. Submit data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine-, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, sub-base fuel tank, and radiator.
2. Submit two (2) sets of product data, certification, test reports and other necessary information, for engine-generator unit and sub-base fuel tank, to the local city Fire Marshall for approval and permit. Contractor and/or Installer shall be responsible for obtaining fire marshal approval for the sub-base fuel tank assembly.
3. Submit calculations and enclosure pad-mount anchoring method (anchor bolt size, embedment and assembly details) to meet 2013 California Building Code seismic requirements, site class D.

C. Certification and Test Reports:

1. Provide Certification for the Protected Sub-Base fuel tank.
2. Provide results of manufacturer's certification of performance testing. Certification and Test Reports (Includes inspections, findings, and recommendations).
3. Certification that the Engine-Generator unit is designed to meet emission limits and operate correctly for the application.

1.4 BCAQMD PERMITTING

A. Complete and Submit the Butte County Air Quality Management District (BCAQMD) form 200, "Permit Application" according to County regulations. Pay application fees (\$150 for standard response, \$225 for expedited review), complete forms, and provide applicable drawings and equipment cutsheets. Obtain Permit to construct prior to ordering generator. Obtain permit to operate prior to final acceptance by Owner.

B. Complete and submit the Butte County Air Quality Management District forms 201 "Authority to construct General Supplemental Information", and 234, "Supplemental Information Internal Combustion Engines" prior to ordering unit.

C. Please note that there are no schools, hospitals, or care facilities within 1000 feet of the project area.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Shop Drawings and Product Data as described under Submittals.
- B. Operation and Maintenance Manuals (3 complete sets):
 1. Instructions and service manuals for normal operation, routine maintenance, oil sampling and analysis for engine wear and engine- maintenance procedures.
 2. Manufacturer's standard manuals for EG Unit.
 3. "As Built" elementary and schematic drawings; wiring diagrams; and panel drawings, in conformance with construction record.
 4. Troubleshooting procedures, with a cross-reference between symptoms and corrective recommendations.
 5. Connection data to permit removal and installation of recommended smallest field-replaceable parts.
 6. Information on testing of electronic circuit boards and an explanation of the EG unit diagnostics.
 7. List special tools, maintenance materials, and replacement parts. Include complete information for tightening of all electrical connections secured with bolts or studs.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specialized in manufacturing the products specified in this section with recent minimum five (5) years experience and with service facilities within 50 miles of project site.
- B. Supplier: Authorized distributor of specified manufacturer with recent minimum five (5) years experience.
- C. Prepare anchor bolt calculations under direct supervision of a professional civil or structural engineer experienced in the design of this work and licensed in the State of California.

1.7 WARRANTY

- A. Furnish two (2) year manufacturer's warranty from date of substantial completion for defective parts and labor.

1.8 MAINTENANCE MATERIALS

- A. Furnish one (1) set of tools required for preventive maintenance of engine-generator system. Package tools in adequately sized metal toolbox.
- B. Furnish two (2) of each: fuel, oil and air filter elements.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver mounted on shipping skids.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic. Provide space heaters if required, to prevent condensation and keep the equipment dry.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication

PART 2 - PRODUCTS

2.1 ENGINE

- A. Manufacturers:
 - 1. Generac, Dual Fuel
 - 2. Substitutions are not permitted
- B. EPA Tier 3 emissions compliant
- C. Product Description: Diesel, 4-cycle, radiator- and fan-cooled, compression- ignition internal combustion engine with natural gas (dual-fuel) supplemental fuel supply, regulator, and control equipment
- D. Fuel System: Ultra Low Sulfur Diesel (ULSD) or Biodiesel (maximum B5, or 5% alternate oil content), with a supplementary natural gas injection.
- E. Engine speed: 1,800 rpm.
- F. Safety Devices: Engine shutdown on high water temperature, high oil temperature, low oil pressure, over speed, and engine over crank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, voltage of starter motors in accordance with manufacturer's instructions. Furnish remote starting control circuit with MANUAL-OFF-REMOTE selector switch or pushbuttons on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation-type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F (32 degrees C), and suitable for operation on 120-Volt, single-phase power supply. Provide 20-amp 120-volt power circuit, including conduit and wire, from nearest available panelboard.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 105 degrees F (40 degrees C). Radiator airflow restriction 0.5 inches of water (1.25 Pa) maximum.
- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, engine-driven water pump. Furnish fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.
- K. Mounting: Heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails. Furnish unit with suitable spring-type vibration isolators. Provide mounting bolts sized for 2007 California Building Code seismic requirements, site class D.

2.2 GENERATOR

- A. Product Description: NEMA MG1, single-phase, re-connectable, brushless synchronous generator with brushless exciter.
- B. Rating:
 - 1. EGU-1: 600-kW, 480/277 volt 3-phase, 4-wire, 60 Hz at 1,800 rpm.
 - 2. EGU-2: 200-kW, 480/277 volt 3-phase, 4-wire, 60 Hz at 1,800 rpm.
- C. Insulation Class: H.
- D. Temperature Rise: 125 degrees C standby.
- E. The generator shall be rated for delivering output KVA at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.
- F. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to the single phase or three-phase fault at approximately 300% of rated current for not more than 10 seconds.
- G. The generator set shall meet all requirements for NFPA 110 Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit; component level type tests will not substitute for this requirement.
- H. The engine generator unit shall be listed to meet UL 2200 or submit to an independent third party certification process to verify compliance as installed.

2.3 VOLTAGE REGULATION

- A. Furnish generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Furnish manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.4 GOVERNOR

- A. Product Description: Electronic Isochronous governor to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

2.5 ENGINE GENERATOR SET CONTROL

- A. Product Description: Microprocessor-based digital control system, designed to provide governing, voltage regulation, metering, protective relaying, automatic starting, monitoring, and control functions for the generator unit.
- B. Control System shall be designed to allow local monitoring and control of the generator unit and remote monitoring and control as described in these specifications.

- C. Control system shall be mounted on the generator unit. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration condition encountered. The controls shall be UL508 labeled, CSA282-M1989 certified, and meet IEC8528 part 4. The control, including all control, monitoring and protective functions, shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std. 801.2, 801.3 and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE 587 for voltage surge resistance. Manufacturers utilizing components that have not been tested as a system, as installed, (as demonstrated by a statement of performance on standard published literature) shall conduct RFI/EMI testing on the equipment in the manufacturer's facility prior to shipping the equipment to the project job site. Voltage surge testing shall be performed on an identical prototype unit.
- D. Control voltage shall be 12 or 24 volts DC. Control system shall withstand DC surge voltage produced by the battery-charging alternator operating at full load when the battery bank is disconnected. Generator set governing, voltage regulation, protection, and control equipment shall be capable of proper operation within the typical battery voltage levels.
- E. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure door shall be gasketed.
- F. All switches shall be provided with fully illuminated backlit labels, and all metering shall be individually lighted to allow for easy reading of functions in a completely dark room.
- G. All adjustments to the control system shall be made from the front of the generator set control panel, with the aid of a digital readout display integral to the equipment. No rotary pots shall be acceptable for any function of the control system provided for the generator set.
- H. Control equipment shall contain a system of diagnostic LEDs to assist in analyzing proper system function.
- I. The entire generator set control system as supplied shall be capable of being directly monitored and controlled by a personal computer connected to the control for monitoring, diagnosis, service, and adjustment of the system via an RS232 port on the control.
- J. The generator set mounted control shall include the following features and functions:
 - 1. Three- (3) position selector switch or independent pushbuttons labeled RUN/OFF/AUTO. In the RUN position the generator shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
 - 2. Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down and be locked out from automatic restarting. Reset of the control shall require reset of the emergency stop switch and the control system.
 - 3. Pushbutton RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
 - 4. Push-button PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched

off several minutes after the switch is depressed or after the switch is depressed a second time. Lamps shall be LED type.

5. Push-button LAMP TEST switch. Depressing the lamp test switch shall cause all the alarm and status lamps on the panel to be lighted, and cause the digital display panel to sequentially display all the alarm and status messages in the control system.
- K. Emergency Generator Control Panel shall be NEMA 250, Type 1 generator-mounted control panel enclosure with engine and generator controls and indicators. Furnish provision for padlock and the following equipment features:
1. Frequency Meter: 45-65 Hz range, digital display preferred (or 3.5-inch dial).
 2. AC Output Voltmeter: digital display preferred (or 3.5-inch dial), 2 percent accuracy, with phase selector switch.
 3. AC Output Ammeter: digital display preferred (or 3.5-inch dial), 2 percent accuracy, with phase selector switch.
 4. Output voltage adjustment.
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, over speed, and over crank.
 6. Engine Start/Stop selector switch or pushbuttons.
 7. Engine running time meter.
 8. Oil pressure gauge.
 9. Water temperature gauge.
 10. Auxiliary Relay: Three Pole Double Throw (3-PDT) operates when engine runs with contact terminals pre-wired to terminal strip.
 11. Additional visual indicators and alarms in accordance with NFPA 110.
 12. Remote Alarm Contacts: Factory-wired SPDT contacts to terminal strip for extending each alarm function to a Control Panel or PLC for remote indication, in accordance with NFPA 110.
 13. High Battery voltage alarm.
 14. Low Battery voltage alarm.
 15. Low Fuel alarm.
 16. System ready.
 17. Anticipatory high water temperature.
 18. Anticipatory low oil pressure.
 19. Low coolant temperature.
 20. Switch in Off Position alarm.
 21. Over crank alarm.
 22. Emergency Stop alarm.
 23. High Water temperature alarm.
 24. Over speed alarm.
 25. Low Oil Pressure alarm.
 26. Line power available.
 27. Generator power available.
 28. Lamp test and horn silence switch.
- L. Alarms: Provide wiring and conduit between ATS and engine-generator alarm points for a complete operating system. Provide display windows with 3/8-inch engraved black letters on white background for each annunciated alarm. Provide at least one spare blank window for future use.
1. Engine Run
 2. Engine Trouble

3. High Fuel Alarm
4. Low Fuel Alarm
5. Engine Over speed shutdown
6. Fuel Leak in secondary containment tank
7. All other critical shut down function as recommended by the EG unit manufacturer
8. Spares

M. Power Source: 120-VAC. Provide 20 amp, single pole, circuit breaker in nearest available switchboard or panelboard. Provide conduit and wire from power source.

2.6 GENERATOR PARALLELING CONTROL

A. Each on board generator controller shall include the necessary functionality for load sharing and paralleling with another generator of any size from the same manufacturer.

B. Each Generator shall include an integral electrically operated, mechanically held paralleling switch.

2.7 GENERATOR SET REMOTE ANNUNCIATOR PANEL

A. The generator set shall be connected to a manufacturer recommended or supplied remote annunciator panel with the following features at a minimum:

1. Control:
 - a. Manual Start / Stop
2. Monitoring:
 - a. Running / Ready
 - b. General Failure
 - c. Low Fuel
 - d. High Fuel
 - e. High Temp
3. Alarm:
 - a. High Temp
 - b. Low Fuel
 - c. General Failure
 - d. High Fuel (visual and audible)

B. Power Source: 120-VAC. Provide 20 amp, single pole, circuit breaker in nearest available switchboard or panelboard. Provide conduit and wire from power source.

2.8 GENERATOR SET AND ENGINE CONTROL FUNCTIONS

A. The control system provided shall include cycle cranking system, which allows for user selected crank time, rest time, and number of cycles. Initial setting shall be 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.

B. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled and the engine protection parameters for engine oil pressure and engine temperature shall be reduced to proper levels to reflect the lower engine operating speed.

- C. The control system shall include the engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.
- D. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit the exhaust smoke while the unit is starting. The control system shall automatically adjust governor gain and stability settings to compensate for engine performance variation related to engine temperature.
- E. The control system shall include time delay start (adjustable 0-100 seconds) and time delay stop (adjustable 0-30 minutes) functions. Indicators shall be provided to reflect that the time delays are in operation, and the time remaining for completion of the time delay period.
- F. The starting control logic shall check for engine rotation at each signal for the engine starter to run. If the engine rotation is not present when the starter is operating, a "fail to crank" alarm and shutdown shall be indicated on the generator set control panel.
- G. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature that is capable of discriminating between failed sender or wiring components, and an actual engine failure conditions.
- H. Generator set start contacts shall be rated 10 amps at 32 VDC.
- I. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is outside manufacturer specified tolerances. During engine starting, the low voltage limit shall be disabled, and the system shall conduct a battery capacity test. A "weak battery" alarm shall be initiated if the starting/control battery does not pass this test.

2.9 OUTDOOR SOUND-ATTENUATING ENCLOSURE

- A. The outdoor weather-protective, sound attenuating, rodent proof, enclosure shall be designed to allow full-load operation of the generator set, and all of its accessories shall be sized for the exact unit being furnished. Adequate metal screening shall be installed at all engine-generator unit openings to prevent rodents from entering the enclosure.
- B. Reinforced steel housing shall allow access to control panels and service points, with lockable doors and panels.
- C. Roof shall have a positive camber for moisture runoff. The exhaust outlet(s) shall be supplied with rain guard(s) 1 inch above enclosure to prevent moisture from entering the enclosure.
- D. Walls shall be a minimum of 1½" deep and of 14-gauge steel.
- E. Air openings shall include fixed louvers sized to allow proper airflow.
- F. Exhaust silencer shall be installed inside the enclosure. Maximum noise level allowable for the installed unit is 70 dB at 23 feet.
- G. Enclosure shall be provided with Manufacturer's standard marine-grade finish.

2.10 SUB-BASE FUEL TANK

- A. Product Description: factory-fabricated, secondary contained, sub-base fuel tank with dual integral float-controlled valve and pump with capacity for 24-hours of continuous operation at 100% load.
- B. Tank Construction:
1. Dual wall, corrosion resistant steel tank.
 2. Internal tank shall be rectangular in shape, listed and constructed in accordance with UL 142 Standard for Generator-Base Tanks.
 3. Inner and outer steel tank shall be constructed of a minimum 3/16-inch thick A-36 Hot Rolled Steel.
 4. Tank and associated anchorage shall meet 2007 California Building Code seismic requirements, site class D.
 5. The internal tank shall be pressure tested and pass a test of 5 psi at the factory.
 6. The tank shall be designed with an over spill containment.
 7. The tank shall include atmospheric and engine- venting nozzles sized to UL requirements.
 8. The tank shall have labels to meet applicable codes, Flammable, No Smoking, product content, and tank capacity, etc.
 9. Each nozzle on the tank shall be identified for its intended use.
 10. The tank shall be designed to meet weight loads of the engine-generator set.
 11. The tank shall be designed with earthquake, hurricane, and flood tie down points.
- C. Tank Painting:
1. Tank shall have manufacturer's standard marine grade coating system.
 2. Bottom of tank shall be coated with coal-tar epoxy.
- D. Certification: Based on the Manufacturer's published literature, the proposed generator base fuel tank shall have the following certifications:
1. The internal and external tank shall be constructed in accordance with UL 142.
 2. The tank shall have an identifying UL Nameplate attached with the following:
 3. "Special Purpose Flammable Liquid Tank Protected Secondary Containment Generator Base Tank UL 142"
 4. "This tank is Intended for Installation In Accordance With NFPA 30, NFPA 30A, Or NFPA 31, NFPA 37, NFPA 110"
 5. Tank Serial number, Manufacturer's name, location and telephone number, Date of Manufacture, Model number of Tank, and Maximum Generator Weight.
 6. Primary Tank Capacity in gallons, Containment Percentage.
 7. "Tank Requires Emergency Relief Venting, Capacity Not Less Than (To be provided by fuel tank vendor) Cubic Feet per Hour, PRIMARY TANK AND (To be provided by vendor) Feet per Hour ANNULAR SPACE."
 8. "Tank is intended for stationary Installation Only. Tank shall be inspected to determine suitability after fire exposure."
 9. "For Diesel Fuel Only."
 10. "Pressurized Primary Tank When Pressure Testing Annular Space. Follow Installation Instructions."
- E. Furnish flexible fuel line connections, fuel gauge, check valve, high fuel level alarm contact, and indicating light.

- F. Provide fuel fill valve to be accessible from outside the emergency generator enclosure. The fill valve shall be at or below the overfill vent level. Provide a five (5) gallon fuel spill containment enclosure with lockable cover as required by the local agency.
- G. Conform to NFPA 30.
- H. Controls:
 - 1. Monitoring: Low-level control and alarm, high level control and alarm, leak- detection monitoring and alarm system.
 - 2. Low Level Alarm Sensor: Separate device to operate alarm contacts at 25 percent of normal fuel level.
 - 3. High Level Alarm Sensor: Separate device to operate alarm and redundant fuel shutoff contacts at 98 percent of normal fuel level.
 - 4. Piping connections: Include fuel suction and return lines, local fuel fill, vent line, overflow line, and tank drain line complete with shutoff valve.
 - 5. Redundant High-Level Fuel Shutoff: Actuated by the high-level alarm sensor in primary tank. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator unit.
- I. Leak Detection System:
 - 1. Calibrated leak detection and monitoring system complying with UL1238 with probes, sensors, switches and remote alarm panel located in the engine-generator unit enclosure.
 - 2. Locate leak detection switch in rupture basin and connect to provide audible and visual alarm in the event of sub-base tank leak.
 - 3. Locate leak detection switch in double-contained fuel line (at lowest point) to provide audible and visual alarm in the event of a leak in the fuel line.
 - 4. Provide alarm contacts for remote indication and alarm of a fuel leak.
- J. Fuel Oil:
 - 1. Provide ULSD for commissioning and testing of the engine-generator unit.
 - 2. Provide ULSD to fill tank once acceptance testing has been completed.

2.11 ACCESSORIES

- A. Exhaust Silencer: Critical-type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions. Maximum noise level allowed is 75 dBA at 23 feet.
- B. Metal Roof Thimble: Where unit is installed indoors, provide ventilated metal roof thimble for all high temperature (greater than 100 degrees C) wall, ceiling and roof penetrations.
- C. Batteries: Heavy-duty, diesel-starting deep cycle gel pack/absorption glass-mat (AGM) type storage batteries, 12 or 24 volts, sized as recommended by the engine-generator manufacturer. Match battery voltage to starting system. Furnish cables and clamps.
- D. Battery Tray: Treated for electrolyte resistance; constructed to contain spillage.
- E. Battery Charger: Solid state to operate with type of batteries furnished. Current limiting type designed to float at 2.17 volts for each cell and equalize at 2.33 volts for each cell. Furnish overload

protection, full wave rectifier, DC voltmeter and ammeter, and fused input. Furnish enclosure to meet NEMA 250, Type 1 requirements, or furnish as an internal component of the ATS. Provide 20-amp 120-volt power circuit, including conduit and wire, from nearest available panelboard.

- F. Line Circuit Breaker: NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole. Furnish battery voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.
- G. Load Bank Circuit Breaker: NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole. Furnish battery voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.

2.12 SOURCE QUALITY CONTROL

- A. Provide shop inspection and testing of completed assembly.
- B. Make completed engine-generator assembly available for inspection at manufacturer's factory prior to packaging for shipment. Notify Engineer at least seven (7) days before inspection is allowed.
- C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Engineer at least seven (7) days before inspections and tests are scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install engraved plastic nameplates in accordance with these Specifications.
- B. Ground and bond generator and other electrical system components in accordance with these Specifications.
- C. Provide Emergency Shutdown procedure and post in a conspicuous location near the engine. Procedure shall indicate location(s) of fuel shutoff valve(s).

3.2 NATURAL GAS CONNECTION

- A. Provide a connection to the natural gas supply onsite, including piping, valves, regulator(s), and appurtenances as required by the generator manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, Section 7.22 as follows:
 1. Visual and Mechanical Inspection
 2. Compare equipment nameplate data with drawings and specifications.
 3. Inspect physical and mechanical condition.
 4. Inspect correct anchorage and grounding.

B. Electrical and Mechanical Tests

1. Perform an insulation-resistance test on generator winding with respect to ground in accordance with ANSI/IEEE Standard 43.
2. Calculate polarization index.
3. Test protective relay devices in accordance with Section 7.9.
4. Perform phase-rotation test to determine compatibility with load requirements.
5. Functionally test engine shutdown for low oil pressure, over-temperature, over-speed, and other features as applicable.
6. Perform vibration baseline test. Plot amplitude versus frequency for each main bearing cap.
7. Conduct performance test in accordance with ANSI/NFPA Standard 110, Section 5-13 (Installation Acceptance).
8. Verify correct functioning of governor and regulator.
9. Inspect and test fuel oil piping according to NFPA 30 "Testing" Paragraph and NFPA 31 "Tests of Piping" Paragraph.
10. Repair leaks and defects with new materials, and retest system until satisfactory results are obtained.
11. Test and adjust controls and safeties
12. Provide fuel tank hydrostatic testing in the presence of the Fire Inspector per CBC requirements.
13. Test Values
 - a. Polarization index values shall be in accordance with ANSI/IEEE Standard 43.
 - b. Vibration levels shall be in accordance with manufacturer's published data.
 - c. Performance tests shall conform to manufacturer's published data and ANSI/NFPA Standard 110.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Inform Owner and Engineer of the date and time (a minimum of 14 days in advance) and allow the Owner to witness all field testing and commissioning.
- B. Engage the services of a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections, and to assist in testing. Report results in writing.
- C. Testing:
 1. Perform field quality control testing under the supervision of the manufacturer's factory-authorized service representative.
 2. Installer shall provide ULSD fuel and lubricating oil for all testing as noted above.
 3. Installer shall provide a full tank of ULSD diesel fuel at the completion and acceptance of testing.
- D. Tests: Include the following:
 1. Tests recommended by manufacturer.
 2. Adjust generator output voltage and engine speed to meet specified ratings.
 3. International Electrical Testing Association Tests: Perform each visual and mechanical inspection, and electrical and mechanical test stated in NETA ATS for engine-generator sets, except omit vibration baseline test. Certify compliance with test parameters for tests performed.
 4. NFPA 110 Acceptance Tests: Perform Single-step full-load pickup test.

5. Exhaust-System Backpressure Test: Use a manometer with a scale exceeding 40 inches water gauge (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that backpressure at full-rated load is within manufacturer's written allowable limits for the engine.
6. Exhaust Emissions Test: Comply with applicable government test criteria.

E. Coordinate tests for engine-generator with tests for automatic transfer switch, and run them concurrently. Run complete electrical test, including, but not limited to, automatic transfer switch and generator control panel to ensure proper automatic Start-Stop operation. Coordinate testing with Automatic Transfer Switch field service representative.

F. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

G. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests. Provide certified copies of field tests approved and signed by the authorized service representative.

3.5 DEMONSTRATION AND TRAINING

A. Provide four (4) hours of training and instruction for at least four persons, to be conducted at project site with manufacturer's certified field service representative. Instruction shall include handouts to all trainees, procedures for the proper operation, adjustments and maintenance of the engine-generator system.

B. Simulate operation of the engine-generator in manual mode, test mode and causing a power outage by interrupting normal source, and demonstrate that system operates to provide engine- power.

3.6 CLEANING

A. Clean engine and generator surfaces. Replace oil and fuel filters with new filters after unit testing and prior to acceptance of the project.

B. On completion of installation, inspect system components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

END OF SECTION 26 32 13

SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior lighting fixtures, lamps, ballasts, hangars, trim and diffusers.
- B. Exterior lighting fixtures, lamps, ballasts, and poles.
- C. Supports, suspension systems, and blocking.

1.2 REFERENCES

- A. ANSI C78.379 - Electric Lamps - Classification of the Beam Patterns of Reflector Lamps.
- B. ANSI C82.1 - Line Frequency Fluorescent Lamp Ballast.
- C. ANSI/NFPA 101 - Life Safety Code.
- D. International Electrotechnical Commission (IEC)
 - 1. IEC 801-2 Electrostatic Discharge Testing Standard.
 - 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- E. Illuminating Engineering Society of North America (IESNA)
 - 1. LM-79 – Electrical and Photometric Measurements of Solid State Lighting Products.
 - 2. LM-80 – Measuring Lumen Maintenance of LED Light Sources.
- F. National Electrical Manufacturer's Association (NEMA) SSL-1 – Electronic Drivers for LED Devices, Arrays, or Systems.
- G. Underwriters Laboratories, Inc. (UL) 8750 – Light Emitting Diode (LED) Light Sources for Use in Lighting Products

1.3 SUBMITTALS

- A. Product Data
 - 1. Light fixtures.
 - 2. Lamps.
 - 3. Ballasts.

1.4 EXTRA MATERIALS

- A. LED Fixtures
 - 1. Provide 5 percent or two, whichever is greater, of each complete interior LED fixture type for Owner stock for future replacement. Provide only one extra fixture where fixture is listed for use in a hazardous classified environment.

2. Provide one of each complete exterior LED wall or pole mount fixture for Owner stock for future replacement.

B. Other Fixtures

1. Provide 10 percent or four, whichever is greater, of each type of tempered glass lens.
2. Provide 5 percent or two, whichever is greater of each plastic and other security lens type.
3. Provide 10 percent or one case, whichever is greater, replacement lamp for each lamp installed.
4. Provide 5 percent or two, whichever is greater, of each ballast type.

1.5 WARRANTEE

- A. Fixtures and ballasts shall have a minimum five year warrantee.

PART 2 - PRODUCTS

2.1 LIGHT FIXTURES – GENERAL

- A. Provide lighting fixtures, lamps, ballasts and accessories complete and ready for operation. Furnish the fixtures as indicated on the Drawings and as listed in the fixture schedule. Verify in all cases, the lengths and quantity of fixtures necessary to achieve the indicated results.
- B. All lighting fixtures shall have published photometric tests conducted by Electrical Testing Laboratories. Make available the test results upon request. Testing shall include candlepower distribution curves, total fixture efficiency, brightness and shielding angles in longitudinal and transverse directions.
- C. Provide lighting fixtures in the finishes and colors as noted on the Drawings.
- D. Provide the UL and IBEW labels on all lighting fixtures.
- E. Observe the requirements of the CBC Section 2606 regarding plastic lighting diffusers. Fixtures and auxiliary equipment mounted against combustible material shall be approved for such installation.
- F. Make-up fixtures with Type AF or equal fixture wire. Provide an identified, approved landing lug for equipment ground wires.

2.2 LED LIGHT FIXTURES

A. General

1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
2. LED light fixtures shall be a factory assembled luminaire including all required driver and light engine modules integral to and within a single housing. Lead lengths between driver and light engine shall not exceed 3 feet. Remote luminaire/driver installations are not acceptable.
3. LED light fixtures shall be Reduction of Hazardous Substances (RoHS) compliant.

B. LED Driver Modules

1. Description: Universal voltage switching-mode LED driver module with a rated lifetime of not less than 50,000 hours when operated at an ambient temperature of less than 60-degrees C.
2. LED drivers shall include native 0-10V dimming capabilities without additional control devices or field-installed circuitry. Integral short-circuit, open-circuit and overload fault protection to prevent driver failure.
3. LED drivers shall be capable of producing adequate output current to produce the specified light levels. Compatibility of driver and LED light engine must be tested and ensured by driver manufacturer.
4. Minimum efficiency: 85% at full load.
5. Minimum Operating Ambient Temperature: -20° C (-4° F).
6. Input Voltage: 120V to 277V (±10%) AC at 60Hz. Drivers that require DC input shall include an integral converter that accepts standard line voltage AC.
7. Power Factor: ≥ 0.95 .
8. Total Harmonic Distortion: $\leq 20\%$ and meet ANSI C82.11 maximum allowable THD requirements
9. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
10. Electrolytic capacitors to operate at least 20 degrees C below the capacitor's maximum temperature rating when the driver is under fully-loaded conditions and case temperature is 62 degrees C.
11. Maximum inrush current of 2 amperes for 120-Volt and 277-Volt drivers.
12. Withstand up to a 4,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
13. Inaudible in a 27 dBA ambient.

C. LED Light Engine Modules

1. Minimum CRI: 80.
2. Color Temperature: 3500K, unless otherwise noted.
3. Minimum Rated Life: 50,000 hours as per LM79.

2.3 FLUORESCENT LIGHTING FIXTURES

A. Equip fluorescent fixtures with CBM-ETL labeled ballasts provided with internally mounted automatic reset thermal protectors and silver plated sockets.

B. Lenses, reflectors, and trim

1. Provide specialty lenses and frames such as Holophane type low glare lenses as indicated on the lighting fixture schedule. Verify that the fixture frames and trims are designed to function with the selected lens and the particular mounting conditions.
2. Provide substantial light sealing and separation between individual lamp rows in the louver assemblies of 3-lamp recessed parabolic fluorescent fixtures. This shall be accomplished by the provisioning of ballast compartment covers between cells even if no ballasts are contained therein.
3. Tempered Glass Lenses: Clear tempered glass, free from edge defects. Lenses must be held in place with a full compression plate, with no metal to glass contact.

C. Lamps

1. Fluorescent lamps

- a. The contractor shall provide written or photographic documentation that the lamps specified below are used on the project (for LEED compliance requirements). Documents may include but are not limited to: Purchase receipts, photos of the product packaging onsite, or invoices .
- b. All fluorescent lamps shall be low mercury, Federal EPA TCLP compliant, extended life lamps.
- c. T-8 fluorescent lamps shall be extended performance, 3500 Kelvin, 86 CRI color rendering, long-life 36,000 hrs @ 3 hrs/start, GE Ecolux XL SPX lamps.
- d. T-5 fluorescent lamps shall be extended performance, 3500 Kelvin, 85 CRI color rendering, long-life 30,000 hrs @ 3 hrs/start, GE Starcoat Ecolux High output lamps
- e. Compact fluorescent lamps shall be low mercury, 3500 Kelvin, 82 CRI color rendering, 10,000 hrs @ 3 hrs/start, Philips “ALTO PL-T,” or Sylvania “DULUX ECOLOGIC.”
- f. Provide 4100 Kelvin, tri-phosphor, energy saving, slim-line or high output fluorescent lamps where lamps longer than four feet long are specified.
- g. Furnish all fluorescent lamps of the same type, throughout the Project, from the same manufacturer.

D. Electronic Ballasts

1. Manufacturers
 - a. Valmont.
 - b. Advance.
 - c. Universal.
2. Provide fully electronic or hybrid style ballasts.
3. Power factor shall be greater than .85.
4. Ballast factor shall be greater than .87.
5. Total harmonic distortion (THD) shall not exceed: 20% for a four foot fluorescent ballast or 32% for an eight foot fluorescent ballast.
6. Provide UL listed ballasts that meet applicable California Energy Commission requirements.
7. Ballasts must be of the rapid start type; instant start is not acceptable.
8. Acceptable manufacturer: Magnetek, Motorola, or Approved Equal.

E. Dimming Ballasts

1. Manufacturers
 - a. Valmont.
 - b. Advance.
 - c. Universal.
2. Description: ANSI C82.1, high power factor type electronic dimming ballast, ETL approved, UL labeled P.
3. Protected with two internal automatic resetting thermal switch devices for coil and capacitor.
4. Sound Level: ‘A’ for 430-MA or less lamps ‘B’ for 800-ma lamps and ‘C’ for 1,500-MA lamps. Stamp rating on ballast.
5. Provide low temperature ballasts where installed in non-conditioned spaces. Ballasts must operate to 0 degrees F.
6. Provide ballast suitable for lamps specified.
7. Voltage: Match luminaire voltage.
8. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.
9. Comply with California Title 24 energy requirements.
10. Electronic ballasts must be provided within lighting fixtures as follows:

- a. 1 Lamp Fixture: 1 lamp ballast.
- b. 2 Lamp fixture: 2 lamp ballast.
- c. 3 Lamp Fixture: 3 lamp ballast or tandem wiring for 3 lamps.
- d. 4 Lamp Fixture: 4 lamp ballast or two 2 lamp ballast.

F. Rapid Start Fluorescent Ballasts

1. Energy saving type, class P, CBM certified,
2. Ballasts shall have an "A" sound rating.
3. Acceptable manufacturers: Universal, Advance, Valmont, or Approved Equal.
4. Provide zero degree ballasts where used in exterior fixtures.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install fixtures in straight, true lines and without visible gaps between fixtures and building surfaces and between fixtures in continuous rows. For linear wall mounted fixtures, ensure that the wall surface is finished flat, straight, and free of imperfections prior to mounting the fixtures. Replace or repair lighting fixture installations that are out of plumb or that have obvious gaps or misalignment.
- B. Provide fixtures with the appropriate trim frames, flanges, canopies, and finish accessories to accommodate the ceiling conditions. Prior to ordering fixtures, and throughout the Project, verify the exact ceiling types, finishes, and thicknesses and coordinate the fixture installation therewith.
- C. Refer to the Drawings, particularly the architectural elevations and reflected ceiling plans, in determining the exact mounting location and height of lighting fixtures. For wall mounted or suspended fixtures that do not have the mounting heights clearly indicated, contact the Owner for clarification prior to ordering pendants and installing the fixtures.
- D. Following installation of fluorescent lighting fixtures, and prior to completion of the Project, perform a burn in test of the lights. The burn in test shall consist of operating the fixtures continuously for a minimum of forty-eight (48) hours. Replace lamps that are inoperative or that show signs of flicker or color wander. If building power is not available for the burn in test, then provide a portable generator, fuel, and temporary connections for the stipulated period.
- E. Provide final touchup painting to repair fixture finishes which are nicked or marred during installation. Obtain the paint from the fixture manufacturer.

3.2 AUDIBILITY

- A. Fixtures shall be free from any undesirable hum, vibration, or noise. Provide lighting equipment suitable for the intended ambient sound levels. Where necessary to meet this criteria, provide additional means of sound deadening, whether or not specifically indicated. Fixtures that are found to be unsatisfactory in the opinion of the Owner shall be removed and replaced at the Contractor's expense.

3.3 SUPPORTS AND BLOCKING

- A. Provide hangers, suspension cables, and blocking for lighting fixtures that will provide support independent of suspended ceilings, ceiling or wall surfaces, and electrical outlet boxes. Exception: Fixtures less than 12 inches in all dimensions and weighing less than six pounds may be permitted to be supported from the electrical outlet box if the box itself is independently supported by blocking or hangers.
- B. Refer to the Drawings for specific blocking details and seismic mounting details for lighting fixtures.

3.4 EXTERIOR POLE MOUNTED FIXTURES AND BOLLARDS

- A. Provide pole base footings in accordance with the Drawings. Footings shall be reinforced concrete with anchor bolts sized and located in accordance with the manufacturer's recommendations for the geographic locality. Provide reinforced concrete in accordance with the requirements as stipulated elsewhere in these Specifications. Forms for pole bases shall be placed using resin-lined Sonotube concrete forms or Approved Equal to give a smooth finished appearance. Patch and sack cracks and voids in the bases to match the surrounding surface.
- B. Verify the exact location of underground facilities in the vicinity of pole bases prior to boring holes and bring potential conflicts to the attention of Owner. Use an anchor bolt template as provided by the manufacturer for the placement of anchor bolts and substantially brace the forms to ensure that the base remains straight and plumb. Refer to the Drawings for fixture orientation and alignment, and utilize a transit site or snap line to verify same.
- C. Exposed surfaces of concrete bases or footing shall be finished smooth without cracks, voids, or jagged edges. Chamfer and float the base after pouring concrete to achieve a finished appearance. In order to allow leveling of the pole, install the pole base-plate one inch above the top of the concrete footing. Level the pole plumb and pack the space under the base-plate with Embecco dry pack grout.
- D. For fixtures with adjustable aiming or reflectors, arrange to perform a final adjustment of aiming at night under the direction of Owner.

3.5 OBSTRUCTIONS

- A. Verify throughout the Project that mounting locations and suspension systems remain free of obstructions. Suspended or pendant mounted fixtures must be free to swing 45 degrees in all directions without hitting obstructions or other fixtures. Provide seismic rated swivel ball hangars for pendant mounted lighting fixtures to achieve the proper swing.

END OF SECTION 26 51 00

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SECTION 28 31 11 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provision of a new fully addressable fire alarm system including a control panel, programming unit, and addressable initiation and notification devices.
- B. Fire alarm initiation and signal devices.
- C. Conduit and wiring for fire alarm system.
- D. 1-year Central Station monitoring service.

1.2 SUBMITTALS

- A. Provide submittals for the following items:
 - 1. Fire alarm control panel
 - 2. Fire alarm annunciator.
 - 3. Fire alarm initiation devices.
 - 4. Fire alarm notification appliances.
 - 5. Interface devices and accessory components.
- B. Provide a complete deferred approval fire alarm system submittal package to the County of Butte, Department of Emergency Services, Fire Division. The package shall include, but not be limited to, layout plan drawings, riser diagram, wiring diagrams, battery calculations, voltage drop calculations, sound level calculations, bill of materials, device and equipment catalog cut sheets, and California State Fire Marshall (CSFM) listing sheets.
- C. Prepare complete drawings of the entire fire alarm system. The design drawings shall include a point-by-point wiring diagram identifying initiation and notification signal zones conductor colors. Identify devices according to the manufacturer's catalog numbers and indicate their locations on the drawings.
- D. In addition to an approved copy of the fire alarm system submittal, provide a set of comprehensive operating instructions; programming documentation; and system maintenance, testing and alarm documentation to the Owner.
- E. At project completion the factory authorized technician shall provide all on-site software modifications and provide a written report attesting to the proper operations of the completed system.

PART 2 - PRODUCTS

2.1 FIRE DETECTION AND ALARM SYSTEM

- A. Manufacturer
 - 1. Notifier – NFS-320 FACP with appropriate accessories.

2. Approved Equal.

2.2 SYSTEM DESIGN

- A. The fire alarm and detection system modifications shall maintain a complete, supervised system. The system shall be activated into the alarm mode by actuation of any alarm-initiating device. The system shall remain in the alarm mode until initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits, Style D, or to signal line circuits in accordance with NFPA 72. Alarm indicating appliances shall be connected to indicating appliance circuits, in accordance with NFPA 72. All textual, audible, and visual appliances and systems shall comply with NFPA 72.
- B. The system shall be a complete, electrically supervised fire detection system, microprocessor based operating system having the following; capabilities, features and capacities:
 1. Single addressable loop
 2. 252 addressable initiation device capability as a minimum.
 3. Addressable devices shall be polarity insensitive.
 4. Addressable devices shall operate on "standard wire" no special twist or shield shall be required
 5. 4 notification circuits capable of Style Y (Class B), or 2 notification circuits capable of Style Z (Class A).
 6. LED drivers for graphic annunciation.
 7. Remote annunciator/control panel.
 8. DACT capable of sending point information to a Central Station depending on protocol required by the Central Station.
 9. Be programmable from system keypad or Laptop computer.
- C. System Operation
 1. Activation of any manual pull station, smoke detector, heat detector or sprinkler waterflow switch shall activate the building notification appliances.
 2. Activation of any alarm causing devices shall signal the Central Station to an alarm condition.
 3. Activation of a supervisory device shall sound an audible and light LED at the control panel to signal a supervisory condition.
 4. Activation of a supervisory causing device shall signal the Central Station to a supervisory condition.
 5. Activation of a trouble shall sound an audible and light an LED at the control panel to signal a trouble condition.
 6. Activation of a trouble shall signal the Central Station to a trouble condition.
 7. Activation of an alarm shall signal.

2.3 FIRE ALARM CONTROL PANEL

- A. The control panel shall have digital communications, addressable devices, control points and relays. The system shall have the following:
 1. Application specific fire detection
 2. Auto configuration, which, reads all addressed devices on the loop and automatically creates a basic general alarm configuration
 3. Manual changes by the Owner or Notifier distributor without special tools.
 4. Windows type software to make configurations easier.

5. Eighty- (80) character backlit LCD display with full system control and up to forty (40) character available for custom message on display.
 6. Fully field programmable from the local display or by a PC configuration tool.
 7. 800-event history log, minimum.
 8. Alarm verification
 9. Cross zoning
 10. Positive Alarm Sequence
 11. Walk test by a single individual in either a silent or audible mode.
 12. Maintenance and Technician level with Password protection.
 13. Standard with 159 addressable detection and 159 addressable monitoring devices.
 14. Optional Peer-to-Peer networking with at least 100 other comparable panels.
- B. The system shall support off site reporting modules within the enclosure shall include one of the following modules in accordance with the requirements of this specific project site:
1. A system DACT shall be supplied with the following:
 - a. Support two (2) lines and up to four (4) accounts
 - b. Can transmit serial information by point to the Central or Remote Station.
 - c. Be capable of transmitting information in the following protocols as a minimum; SIA DCS 8,SIA DCS 20, Ademco Contact ID, 3/1 1400 Hz, 3/1 2300 Hz, 4/2 1400 Hz and 4/2 2300Hz.
 2. A Municipal Tie/Lease Line module shall provide local energy output for municipal call box connection or a reverse polarity output for lease line connection.
- C. Power Supply
1. The power supply shall be capable of 6 amps. A maximum of 3.0 amps available for the NAC circuits. This can be expanded to 6 amps by adding an additional transformer. The power supply/battery charger shall support at least 18 AH battery sets.
 2. Provide self-contained, automatically recharging batteries. Upon failure of incoming line power, the batteries shall provide a minimum of 24 hours of standby power followed by 5 minutes of alarm operation. Provide batteries that are rated at 125% minimum, of the above determined capacity.
- D. Enclosure
1. The system enclosure shall be sized to carry all the modules required to meet the specification requirements.
- E. Printer Interface
1. An interface for a printer shall be provided to allow system events to be printed.
- 2.4 FIELD PROGRAMMING UNIT
- A. The programming tool shall program the intelligent devices addresses. The unit shall test the loop wiring for grounds, opens and shorts. Systems not having this ability shall test all the above items and provide a written report documenting the testing procedure as required in the submittal section.
- B. The system programmer shall print labels for all addressable devices and contain the complete SLC circuit and device numbers.

2.5 ADDRESSABLE INITIATION DEVICES

- A. Smoke detectors shall be intelligent photoelectric detectors with thermal element that provides digital communications to the FACP. Detectors shall be listed for use as open area protective coverage, in duct installation and duct sampling assembly installation and shall be insensitive to air velocity changes. Detectors shall be programmable as application specific, selected in software for a minimum of eleven environmental fire profiles unique to the installed location. These fire profiles shall eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber. The detector shall support the use of a relay, or LED remote indicator. The detector shall not exceed 2.5 inches of extension below the finish ceiling. Detector wiring shall not require any special cable.
 - 1. The intelligent smoke detector shall be Notifier FSP-851 or Approved Equal.
- B. Addressable thermal detectors shall be a rate of rise detectors rated at 135°F.
 - 1. The detector shall be a Notifier FST-851 or Approved Equal.
- C. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box. Detectors located in concealed locations (above ceiling, etc.) shall have a remote visible indicator lamps. Bases shall be supplied with the following features as required for performance to this specification. Select the bases based on manufacturer's requirements for the devices specified
- D. Intelligent interface modules shall be supplied for the monitoring of contact type initiation devices and for the control of electrical devices as required by project conditions. Modules shall be intelligent analog signaling circuit interface modules as follows:
 - 1. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory or status contact type devices.
 - 2. The single circuit interface shall also be available as a freestanding shrink-wrapped unit with pigtail wire leads for direct mounting with contact devices.
 - 3. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices with form C software programmable control contacts for the management of specified electrical loads as required by this specification.
 - 4. Dual circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices.

2.6 NOTIFICATION APPLIANCES

- A. The horn or horn/strobe appliance as indicated on the drawings shall be a synchronized temporal horn with a synchronized strobe light with multiple candela taps to meet the intended application. The appliance shall be red or white as indicated on the drawings. The strobe light taps shall be adjustable for 15, 30, 75, and 110 candela. The appliance shall be red for wall mounted and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application.
 - 1. Provide Wheelock NS/NH series devices or Approved Equal.

- B. The strobe only appliance as indicated on the drawings shall be a synchronized strobe light with multiple candela taps to meet the intended application. The strobe light taps shall be adjustable for 15/75, 30/75, 75, and 110 candela. The appliance shall be red for wall mounting and white for ceiling mounted. Ceiling mounted appliances shall be rated for that application.
 - 1. Notifier SR series or Approved Equal.
- C. The explosion proof strobe only appliance as indicated on the drawings shall be a synchronized strobe light with candela rating to meet the intended application. The appliance shall be red for wall mounting. The appliance shall be listed for use in a NEC Class 1 division 1 environment.
 - 1. Cooper SM series or Approved Equal.

2.7 CONDUIT, WIRE, & CABLE

- A. Conduit: Conduit and fittings shall comply with UL 6, UL 1242 and UL 797.
- B. Wiring: Wiring for 120-volt ac power shall be No. 12 AWG minimum. Wiring for low voltage dc circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color-coded. Conductors used for the same functions shall be similarly color-coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks are allowed for addressable systems.
- C. Special Tools and Spare Parts: Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed. Smoke detectors shall not be installed until the building has been thoroughly cleaned.
- B. Boxes: All devices and appliances shall be mounted to or in an approved electrical box. Boxes shall be installed plumb and firmly in position. Extension rings with blank covers shall be installed on junction boxes where required. Junction boxes served by concealed conduit shall be flush mounted.
- C. Wiring: All system wiring shall be installed in conduit. Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made

using screw terminal blocks. Do not splice fire alarm conductors in underground or exterior pull-boxes. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors. The use of wire nut type connectors are prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

- D. Marking: Each conductor shall be identified as shown on the drawings with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible. A consistent color code for fire alarm system conductors throughout the installation. "Fire alarm system" decal or indicator shall be applied to all junction box covers and visible conduits in each room or space.
- E. Auxiliary Equipment: Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

3.2 FIELD QUALITY CONTROL AND PRELIMINARY TESTING

- A. Complete testing and certification shall be performed by a certified Notifier technician or manufacturer representative.
- B. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.
- C. The Contractor shall notify the Owner's Representative 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.
- D. Preliminary Testing Procedure
 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
 3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
 4. All test equipment, the installing contractor shall make instruments, tools and labor required to conduct the system tests available. The following equipment shall be a minimum for conducting the preliminary and acceptance tests:
 - a. Ladders and scaffolds as required to access all installed equipment.
 - b. Multi-meter for reading voltage, current and resistance.

- c. Two way radios, and flashlights.
- d. A manufacturer recommended device for measuring airflow through air duct smoke detector sampling assemblies.
- e. Decibel meter.
- f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.3 ACCEPTANCE TESTING

- A. Acceptance testing shall be in accordance with NFPA 72 and this specification. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The contractor shall be responsible for the performance of the acceptance testing, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.
- B. Conduct the acceptance testing procedure (ATP) in the presence of the Owner's Representative, the local Fire Marshal and/or the local Fire Department.
- C. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
 - 1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification circuits.
 - c. Primary power or battery disconnected.
 - 2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
 - 3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
 - c. Correct history logging for all system activity.
 - 4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct point transmitted for each alarm input
 - b. Trouble signals received for disconnect
 - 5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

- D. Complete and submit to the Owner's Representative the signed "Certificate of Completion" as per NFPA 72 Section 1-7.21 following the successful completion of the witnessed acceptance testing procedure.

3.4 DOCUMENTATION

- A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
 1. System record drawings and wiring details including one set of reproducible masters and drawings on a CD ROM in a DXF format suitable for use in a CAD drafting program. Original drawings must be provided by the systems engineering firm.
 2. System operation, installation and maintenance manuals.
 3. System matrix showing interaction of all input signals with output commands.
 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
 5. System program showing system functions, controls and labeling of equipment and devices.

3.5 SERVICES

- A. The contractor shall warrant the entire system against mechanical and electrical defects for a period described in the contract general conditions. This period, shall begin upon completed certification and test of the system or upon first beneficial use of the system, determined by the Engineer, whichever is earlier.
- B. The contractor performing the contract services shall be qualified and listed to maintain ongoing certification of the completed system to the UL for specific installed system listing.
- C. The installation contractor shall furnish training as follows for a minimum of two employees of the system user:
 1. Training in the receipt, handling and acknowledgment of alarms.
 2. The total training requirement shall be a minimum of 2 hours, but shall be sufficient to cover all items specified.

END OF SECTION 28 31 11

SECTION 32 9300 - LANDSCAPE INSTALLATION

PART I - GENERAL

1.1 WORK INCLUDED

- A. Furnish all labor, material, equipment and services necessary to provide all landscape work, complete in place, as indicated on Drawings and specified herein.

Work specified in this Section, but is not limited to the following:

1. Soil preparation
2. Root Barriers
3. Trees
4. Shrubs
5. Groundcover
6. Bulbs
7. Planting container backfill
8. Decomposed Granite
9. Mulches

- B. Related Work Specified in Other Sections

1. 32 9115 Soil Preparation
2. 32 8400 Planting Irrigation
3. 32 9500 Landscape Maintenance

1.2 QUALITY ASSURANCE

- A. Source Quality Control

1. Submit documentation to the Landscape Architect at least sixty (60) days prior to start of planting that all plant material has been ordered. Arrange procedure for observation of plant material with the Landscape Architect at time of submission.
2. Plants shall be subject to observation and approval of the Landscape Architect upon delivery for conformity to specifications. Such approval shall not impair the right of observation and rejection during progress of the work.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery

1. The Contractor, upon request by the Landscape Architect, shall provide receipts, delivery tickets, load tickets, etc. of all items delivered to the job site to verify products and total quantities.
2. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name trademark, and conformance to State Law.
3. Deliver plants with legible identification labels.
 - a. Label trees, evergreens, bundles of containers of like shrubs, or ground cover plants.
 - b. State correct plant name and size indicated on plant list.
 - c. Use durable waterproof labels with water-resistant ink which will remain legible for at least sixty (60) days.

4. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.
5. The Contractor shall notify the Landscape Architect forty-eight (48) hours in advance of delivery of all plant materials for observation.

B. Storage

1. Store plant material in shade and protect from weather.
2. Maintain and protect plant material.

C. Handling

1. Do not drop plant materials.
2. Do not pick up container plant material by stems or trunks.

1.4 JOB CONDITIONS

- A. Planting: Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.
- B. Scheduling: Install trees, shrubs, and ground cover plant material before lawn areas are installed and after irrigation system is operable.
- C. Protect work and materials from damage due to construction operations by other contractors and trades and by vandalism. Maintain protection during installation and maintenance period.

1.5 SAMPLES AND TESTS

- A. Provide one quarter cubic foot samples of wood chip, decomposed granite and crusher dust mulches to Landscape Architect for approval prior to installation.
- B. The Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time; the Contractor shall furnish samples upon request by Landscape Architect. Rejected materials shall be immediately removed from the site at the Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by the Contractor.

1.6 GUARANTEE AND REPLACEMENT

- A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship for a period of one (1) year. Any plant found to be dead or not in a satisfactory or healthy condition due to faulty materials, workmanship, or improper maintenance as determined by the Landscape Architect, shall be replaced by the Contractor at his expense.
- B. Replacement: Any materials found to be dead, missing or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be the sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within

fifteen (15) days of written notification by the City's Representative. All replacement materials and installation shall comply with the Drawings and the Specifications.

PART 2 - PRODUCTS

2.1 GENERAL

All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. The Contractor shall supply the Landscape Architect with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance of bearing the manufacturer's guaranteed analysis.

2.2 PRODUCTS

A. Soil Conditioner

1. Gro-Power Plus: Humus (bacteria included based fertilizer and soil conditioner with soil penetrant shall consist of the following percents by weight:

- 5 % nitrogen
- 3 % phosphoric acid
- 1 % potash
- 50 % humus
- 15 % humic acids

B. Soil Amendment and Fir Bark Mulch

1. Nitrogen Stabilized Fir Bark Shavings: 0.56 to 0.84% N based on dry weight for fir bark mulch, treated with relative form of nitrogen (NH₃).
 - a. Particle Size: 95% - 100% passing 6.35 mm standard sieve.
80% - 100% passing 2.33 mm standard sieve.
 - b. Salinity: The saturation extract conductivity shall not exceed 3.5 millimeters/centimeter at 25 degrees (25°) centigrade as determined by saturation extract method.
 - c. Iron Content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
 - d. Ash: 0 - 6.0% (dry weight)
2. Agricultural gypsum
 - a. As per soils report recommendations

C. Fertilizer

1. Planting Pit Fertilizer: Shall be Gro-Power Plus (bacteria included) with soil penetrant and shall consist of the following percents by weight:

- 5% nitrogen
- 3% phosphoric acid
- 1% potash
- 50% humus
- 15% humic acid

2. Planting Tablets: Slow-release 21 gram tablets as manufactured by Agriform or approved equal, containing the following percentages of nutrients by weight:

20%	nitrogen
10%	phosphoric acid
5%	potash

D. Imported Soil

1. Imported soil shall be obtained from a source approved by the Landscape Architect.
2. Imported topsoil shall be of friable sandy-loam texture free of refuse, roots, heavy or stiff clay, rocks, sticks, brush or other deleterious materials. Topsoil acidity range (pH) shall be between 6.5 to 7.5 containing a minimum of 4% and a maximum of 25% organic matter. Topsoil shall be free of all noxious weeds. Topsoil samples and analysis shall be submitted to the Landscape Architect for approval prior to delivery of any soil to the project site. Should the Landscape Architect reject any portion of the delivered soil, for any reason, it shall be removed immediately at no cost to the Owner.
3. Topsoil, if rejected, shall be amended to meet specifications. Submit amended topsoil analysis to the City Urban Forester or the Landscape Architect for verification.
4. See also 32 9115 Soil Preparation.

E. Plant Material

1. The plant material indicated on the Drawings by the listed names shall conform to "Standard Plant Names", second edition, except for names not covered therein, the established customs of the nursery trade is followed. All plants shall be true to name, above one of each bundle or lot shall be tagged with the name and size of the plant, in accordance with the standards of practice recommended by the American Association of Nurserymen. All plant materials shall meet the specifications of Federal, State and County laws, requiring observation for plant diseases and insect infestations. Plants shall be symmetrical, typical for variety and species, sound, healthy, vigorous, free from plant diseases, insect pests or other eggs, and shall have healthy, normal root systems, while filling their containers, but not to the point of being root bound. Use only plant materials that are first class representative of the species and cultivars specified and that conform to all State and local laws governing the sale, transportation and observation of plant materials. Plants shall have straight, single trunks, unless otherwise specified on the plans. Those specified to be multi-trunk shall have at least three (3) main leaders from the base. Any and all plants that have any encircling roots (not root bound) shall have root balls lightly slashed on a minimum of three (3) sides to stop encircling root growth. The height and spread of all plant materials shall be measured with branches in their normal position. Sizes of plants shall be as stated on the plant list, five and fifteen (5 & 15) gallon can container stock shall have been grown in that container not less than six (6) months, but shall not have been overgrown in the containers so as to have become root bound.
2. The size of the plants will correspond with that normally expected for species and variety of commercially available nursery stock or as specified in the Special Conditions or Drawings. The minimum acceptable size of all plants, measured before pruning with the branches in normal position, shall conform with the

measurements, if any, specified on the Drawings in the list of plants to be furnished. Plants larger in size than specified may be used with the approval of the Landscape Architect, but if the use of larger plants is approved, the ball of earth or spread of roots for each plant will be increased proportionally. Plant material shall conform to the following Specifications for container stock:

SHRUBS

SIZE	TYPE	EXAMPLE	HEIGHT	SPREAD	CALLIPER
1 Gal.	low growing	Agapanthus - etc.	8-10"	6-8"	
5 Gal.	low growing	Salvia gregii - etc.	15-18"	15-18"	
5 Gal.	tall growing	Dietes bicolor. etc,	24-30"	15-18"	

TREES

5 Gal.	slow growing	Quercus - etc.	5-6'	12-18"	1/4 - 1/2"
5 Gal.	fast growing	Euc. - Prunus - etc.	6-7'	12-18"	1/2 - 3/4"
15 Gal.	slow growing	Quercus - Pyrus - etc.	7-8'	24-30"	3/4 - 1"
15 Gal.	fast growing	Euc. - Prunus - etc.	8-10'	30-36"	1- 1 1/4"
24" Box	slow growing	Quercus - Pyrus - etc.	8-10'	3-4'	1 1/2-1 3/4"
24" Box	fast growing	Euc. - Prunus - etc.	10-12'	4-5'	1 3/4-2 1/2"
30" Box	slow growing	Quercus - Pyrus - etc.	12-14'	6-7'	2 1/2 - 3"
30" Box	fast growing	Euc. - Prunus - etc.	12-14'	6-7'	2 1/2 - 3"
36" Box	slow growing	Quercus - Pyrus - etc.	14-16'	8-10'	2 1/2 - 3"
36" Box	fast growing	Euc. - Prunus - etc.	14-16'	8-10'	2 1/2 - 3"
36" Box	fast growing	Euc.- Prunus - etc.	14-16'	8-10'	2 1/2 - 3"

3. All plants not conforming to the requirements herein specified, shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the work and replaced with new plants at the Contractor's expense. The plants shall be of the species, variety, size and condition specified herein or as shown on the Drawings. Under no conditions will there be any substitution of plants or sizes listed on the plans, except with the expressed written approval of the Landscape Architect.
4. At no time shall trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval and when in the presence of the Landscape Architect and/or as noted on the Planting Specifications.
5. Nursery Grown and Collected Stock
 - a. Plant materials shall conform with the best edition of ANSI Z60.1-1986 American Standard for Nursery Stock.
 - b. Grown under climatic conditions similar to those in locality of project.
 - c. Container-grown stock in vigorous, healthy condition, not root bound or with root system hardened off.
 - d. Use only liner stock plant material which is well established in removable containers or formed homogeneous soil sections.

6. Ground Cover: Ground cover plants shall be grown in flats, peat pots, or taken as cuttings, as indicated on the plans. Flat grown plants (rooted cuttings) shall remain in those flats until trans-planting. The flat's soil shall contain sufficient moisture so that it will not fall apart when lifting the plants. If plants from peat pots are used, the pots shall be protected at all times prior to planting to prevent unnecessary drying of the rootball.
- F. Mulches
1. Wood chip mulch shall be chipped trees branches and tree trunks, particle range of between $\frac{1}{2}$ " to $\frac{3}{4}$ " in diameter by 2" to 4" long, free of chipped diseased trees. Colored or dyed wood products are not acceptable.
 2. Decomposed granite mulch shall be 1/8 inch minus, gold brown in color.
 3. Crusher dust shall be $\frac{1}{4}$ chipped rock gray in color, non graded, Stony Creek , Hamilton City or equal.
 3. Nitrogen stabilized fir bark mulch per PART 2 PRODUCTS, Section A., Paragraph number 1.
- G. Pre-emergent - Pre-emergent, Ronstar or approved equal, prevent weed development in planter areas.
- H. Weed Control - Pre-emergent herbicide ronstar or equal.
- I. Tree Staking Material
1. Stakes for Tree Support
Wood Tree Stakes- Lodge pole pine stakes full-length untreated. Minimum nominal size: two (2) inches in diameter x ten feet (2" x 10') long and pointed at one (1) end (adjust length to fit tree). Stakes shall be free from knots, checks, splits, or disfigurements.
 2. Ties
32" length cinch tie as manufactured by V.I.T. Company, 1-714-871-2309 or approved equal.
- J. Decomposed Granite
"Californian Gold" decomposed granite, #4 sieve minus, available from Felton Quarry 1-831-335-3445 or approved equal.
- K. Root Barrier
By Deep Root Corp. model numbers LB-12-2 and LB-18-3 or approved equal.
- L. Miscellaneous Materials
1. Sand: wash river sand or equal.
 2. Tree wound paint: as approved. Morrison Tree Seal, Cabot Tree Paint, or approved equal.

PART 3 - EXECUTION

3.1 OBSERVATION

- A. Landscape Architect to verify that topsoil has been imported, and final grades have been established prior to beginning planting operations. Landscape Architect to observe, trees and shrub stock plant material for injury, insect infestation and improper pruning. Do not begin planting of trees until deficiencies are corrected or plants replaced.

3.2 LAYOUT OF PLANTING AREAS

- A. Stake or mark all locations for plants and outline of planting beds on ground. Do not begin excavation until plant locations and plant beds are acceptable to the Owner, the irrigation system shall be operational and approved prior to planting.
- B. If an underground construction or utility line is discovered prior to work, other locations for planting may be selected by the Owner.

3.3 FINISH GRADE

- A. Finished grading shall be complete prior to plant installation, conform to **SOIL PREPARATION** specification.

3.4 PLANT INSTALLATION

- A. General
 1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Owner.
 2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
 3. Container shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.
- B. Preparation of planting areas:
 1. After approximate finished grades have been established, soil shall be conditioned and fertilized according to the Horticultural Report. See section 32 9115 Soil Preparation for more information.
 2. All soil areas shall be compacted and settled by application of heavy irrigation to a minimum depth of twelve (12) inches.
 3. At time of planting, the top six (6) inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter one (1) inch in diameter or larger, and shall be free from all wire plaster, or similar objects that would be a hindrance to planting and maintenance. All rock larger than 1 inch to be removed by mechanical means, either by sieve for loose rock and by heavy equipment if solid bedrock.

C. Planting of Trees and Shrubs

1. Excavation for planting shall include the stripping and stocking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
2. Shape
 - a. Vertical sides and flat bottom.
 - b. Plant pits to be square for box material, circular for canned material.
 - c. Scarify sides and bottom of each pit.
3. Protect all areas from excessive compaction when trucking plants or other materials to planting site.
4. Can Removal
 - a. Cut cans on two (2) sides with an acceptable can cutter.
 - b. Do not injure the rootball.
 - c. Do not cut cans with spade or ax.
 - d. Carefully remove plants without injury or damage to rootball.
 - e. After removing plant, superficially cut edge roots with knife on three (3) sides.
5. Box Removal
 - a. Remove bottom of plant boxes before planting.
 - b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.
6. Center plant in pit.
7. Face plants with fullest growth into prevailing wind.
8. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball roots.
9. Remainder of planting pit shall be backfilled with:
 - a. One (1) parts import top soil or approved on-site soil per landscape grading specification.
 - b. One (1) parts nitrogen stabilized fir bark shavings.
 - c. Eighteen (18) pounds Gro-Power Plus planting pit fertilizer per cubic yard of mix.
 - d. Specified type and quantity of planting tablets
10. All plants which settle shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately one-half (1/2) of the height of the root ball. Water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.
11. After the water has completely drained, planting tablets shall be placed adjacent to but not in contact with root ball.
 - a. One (1) tablet per 1-gallon container
 - b. Two (2) tablets per 5-gallon container
 - c. Three (3) tablets per 15-gallon container
12. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least two (2) inches of water. Basin shall be of a size suitable for the individual plant. In no case shall the basin for fifteen (15) gallon plant be less than four (4) feet in diameter; a five (5) gallon plant less than three (3) feet in diameter. The basins shall be constructed of amended backfill materials, and shall not be constructed for trees in turf areas.
13. Pruning - Pruning of trees shall be limited to the minimum necessary to remove injured twigs and branches and to compensate for loss of roots during transplanting, but never to exceed one-third (1/3) of the branching structure. Upon approval of the

City, pruning may be done before delivery of plant, but not before plants have been observed and approved. Prune as per specifications Landscape Maintenance Section 30 9500.

14. Staking

- a. Staking of all trees shall conform to tree staking details.
- b. One (1) tree shall be staked and approved by the City prior to continued staking.

D. Planting of Ground Cover

1. Ground cover shall be planted in straight rows and evenly spaced, unless otherwise noted, and at intervals called out in the Drawings. Triangular spacing shall be used unless otherwise noted on the Drawing.
2. Each rooted plant shall be planted with its proportionate amount of flat soil or in a peat pot in a manner that will insure minimum disturbance of the root system, but in no case shall this depth be less than two (2) nodes. To avoid drying out, planting shall be immediately irrigated after planting until the entire area is soaked to the full depth of each hole, unless otherwise noted on the Drawing.
3. Care shall be exercised at all times to protect the plants after planting. Any damage to plants by trampling or other operations of this Contract shall be repaired immediately.

3.5 MULCH COVER

- A. All planting areas shall be top dressed with a 2 inch layer of decomposed granite, as measured after settling.
- B. Crusher dust mulch and decomposed granite mulch shall be settled by thorough application of water applied from above and not to exceed infiltration rate. Do not compact by mechanical means and do not exceed 85% relative density. Do not compact soil grade beneath mulch by more than 85% relative density.

3.6 WEED CONTROL

- A. Apply weed control to all planting and decomposed granite areas with the exception of landscape medians. Do not apply pre-emergent to medians. Apply weed control after completion of all planting and prior to installation of mulches.
- B. Hand water to dissolve herbicide per manufacturer's specifications.
- C. Apply as per manufacturer's specifications.

3.7 OBSERVATION SCHEDULE

- A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following observations according to the time indicated:
 1. Pre-construction conference - 7 days.
 2. Finish grade review - 48 hours.
 3. Plant material review - 48 hours.
 4. Soil preparation, plant layout, and planting operations. One (1) tree with each type of specified shall be approved prior to planting of trees - 48 hours.

5. End of landscape installation - 48 hours.
6. End of landscape maintenance/Final Acceptance - 48 hours

B. No site visits shall commence without all items noted in previous Observation Reports, either completed or remedied, unless such compliance has been waived. Failure to accomplish punch list tasks or prepare adequately for desired observations shall make the Contractor responsible for reimbursing the City's Representative or Landscape Architect at his current billing rates per hour, plus transportation costs.

3.8 CLEAN UP

After all planting operations have been completed; remove all trash, excess soil, empty plant containers or rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. The Contractor shall pick-up all trash resulting from this work no less frequently than at the end of each day. All trash shall be removed completely from the site. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition acceptable to the City.

3.9 LANDSCAPE MAINTENANCE

Provide Landscape Maintenance as per
LANDSCAPE MAINTENANCE – SECTION 32 9500

END OF SECTION

PROJECT NAME
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS
**326 HUSS LANE
CHICO, CA 95928**

TLCD PROJECT NO:
11054.03

DATE:
07/28/14

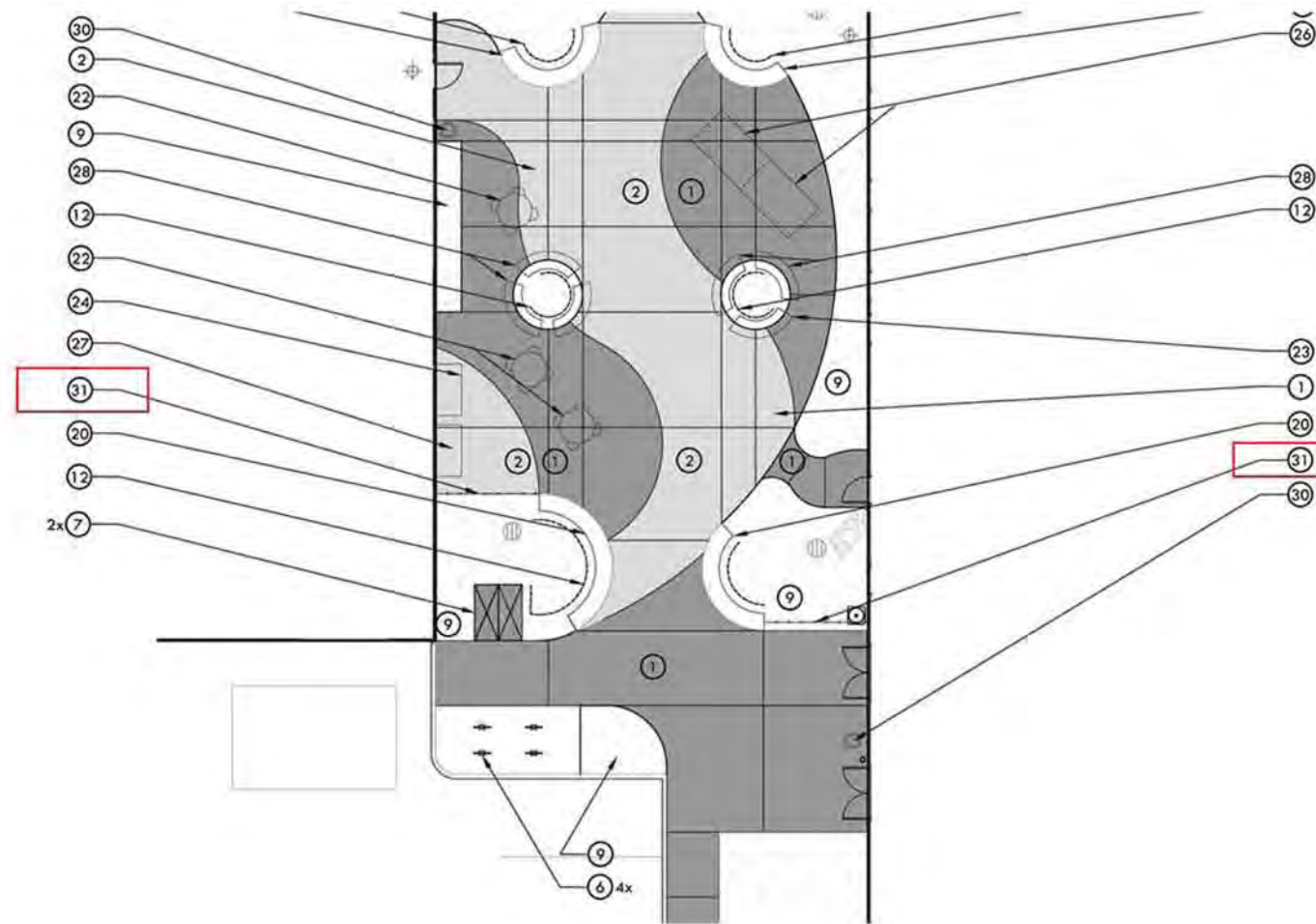
BY:
MELTON DESIGN GROUP

DESCRIPTION:
**1.0 ADDITION OF 6'
DECORATIVE
ARCHITECTURAL
FENCE.**

**2.0 HEIGHT OF
FENCE CHANGE.**

DRAWING NO:

LA 1.0_2



1 PLAZA
SCALE: 1" = 10'

28	24" HIGH BENCH	RADIAL BENCH BY: MMCITE MODEL# VERA SOLO LV5111B INSTALL PER MANUFACTURE SPECIFICATIONS www.mmcite.com / 609.758.0800	--
29	MOUNDING	EACH CONTOUR EQUALS +1' OF ELEVATION. MOUNDS TO BE CREATED FROM ON-SITE CUT AND FILL. PRIORITIZE MOUNDING SO THAT THE NORTHERN LANDSCAPE AREA NEAR AZTEC DRIVE IS FIRST. NORTH WEST LANDSCAPE AREA IS SECOND AND WESTERN AREA IS LAST. SEE ENGINEER'S PLAN.	--
30	WASTE AND CIGARETTE RECEPTACLE	LENA - LN115T MMSITE.COM	
31	6'-0" DECORATIVE ARCHITECTURAL FENCE	SEE CIVIL ENGINEER'S & ARCHITECT'S PLANS	

1.0

		FOR STRUCTURAL SECTION.	
3	ENTRY MONUMENT	SEE ARCHITECT'S PLAN.	--
4	7' SECURITY FENCE	SEE CIVIL ENGINEER'S & ARCHITECT'S PLANS	--
5	TRAFFIC GATE	SEE CIVIL ENGINEER'S & ARCHITECT'S PLANS	--
6	CAST ALUMINUM BIKE RACK - 2 BIKES DEEP RACK		

2.0

PROJECT NAME
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS
**326 HUSS LANE
CHICO, CA 95928**

TLCD PROJECT NO:
11054.03

DATE:
07/28/14

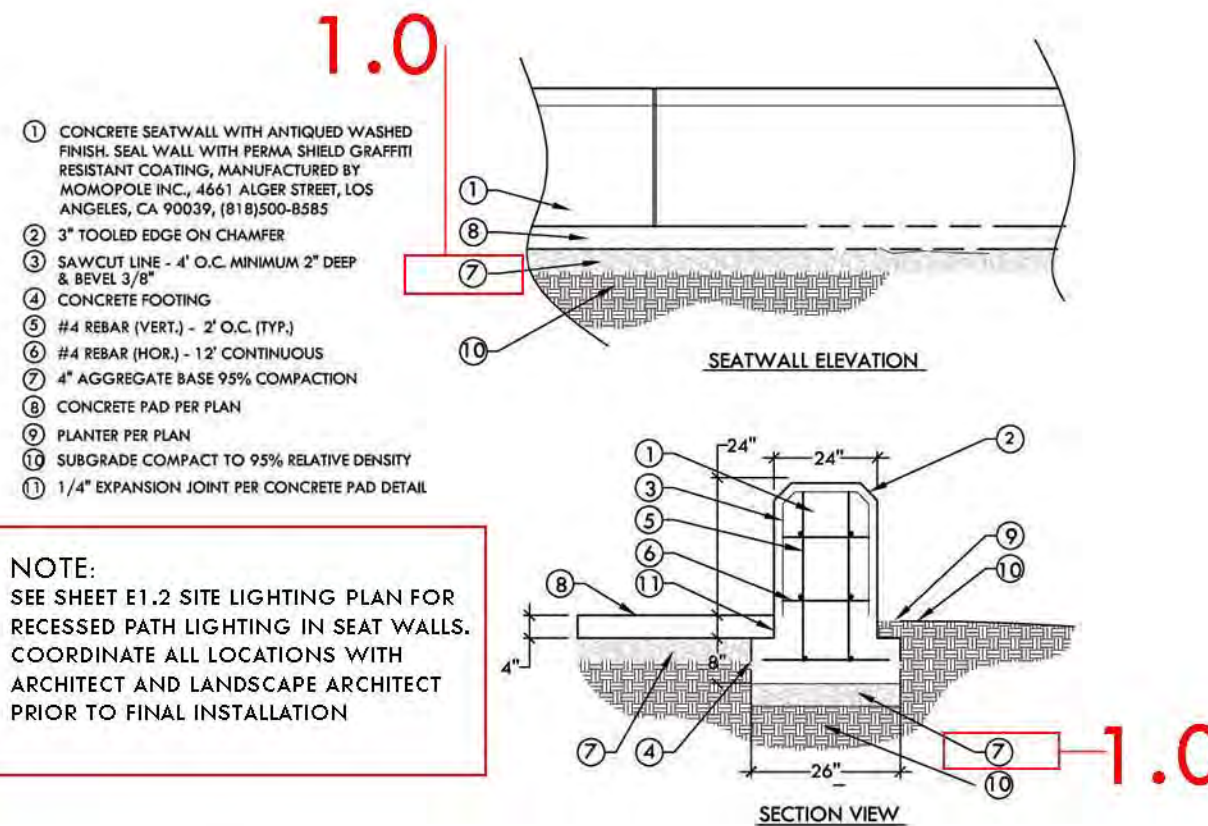
BY:
MELTON DESIGN GROUP

DESCRIPTION:
**1.0 CALLOUT
ADJUSTMENT.**

**2.0 ADDITION
OF NOTE.**

DRAWING NO:

LA 2.0_2



2.0 NOTE:
SEE SHEET E1.2 SITE LIGHTING PLAN FOR
RECESSED PATH LIGHTING IN SEAT WALLS.
COORDINATE ALL LOCATIONS WITH
ARCHITECT AND LANDSCAPE ARCHITECT
PRIOR TO FINAL INSTALLATION

3 SEAT WALL
L-2.10 NOT TO SCALE



111 SANTA ROSA AVENUE, #300
SANTA ROSA, CA 95404
TEL 707.525.5600
FAX 707.525.5616

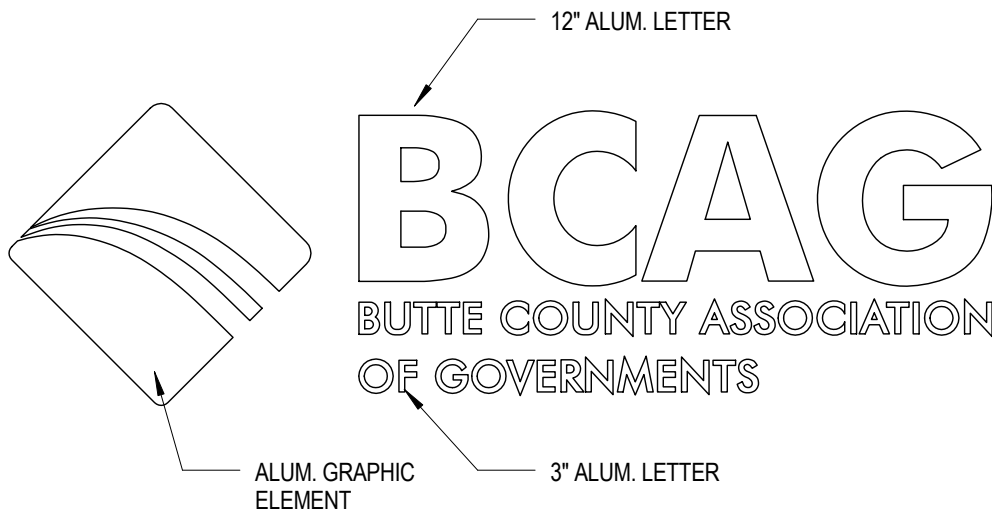
WWW.TLCD.COM

PROJECT NAME

**Butte Regional Transit
Operations Center**

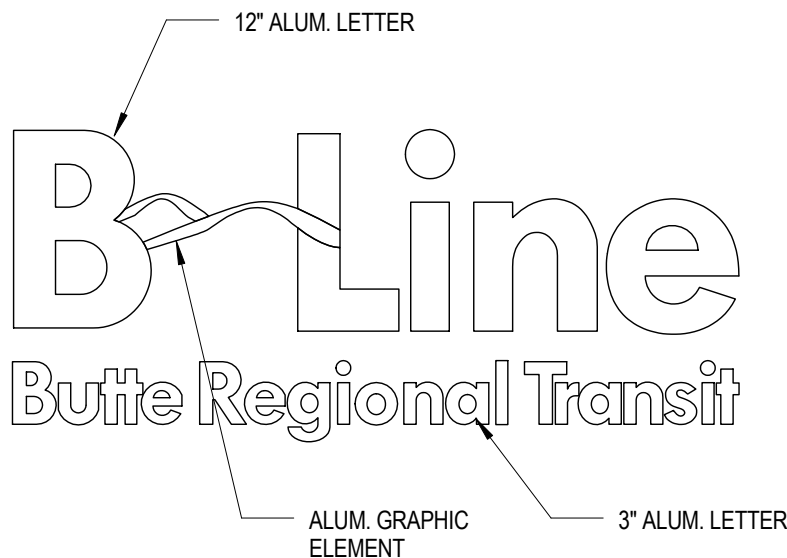
PROJECT ADDRESS

**326 HUSS LANE
CHICO, CA 95928**



1 BCAG SIGNAGE

3/4" = 1'-0"



TLCD PROJECT NO:
11054.03

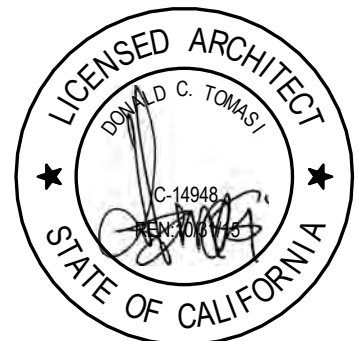
DATE:
07/22/14

BY:
KT

DESCRIPTION:
**A4.1 DIMENSIONAL
SIGNAGE
CLARIFICATION**

2 B-LINE SIGNAGE

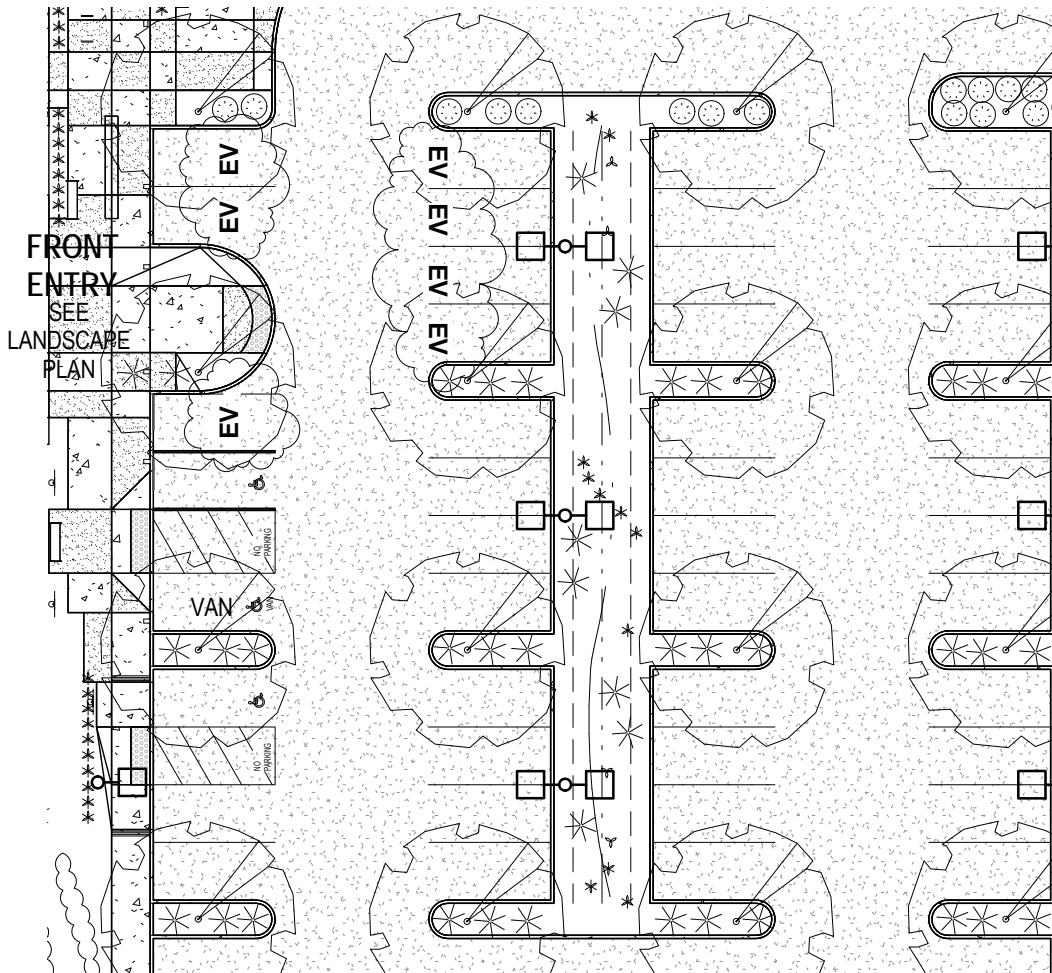
3/4" = 1'-0"



DRAWING NO:

NOTE: PROVIDE SHOP DRAWINGS, SHOWING ALL PROPOSED DIMENSIONS FOR REVIEW AND APPROVAL PRIOR TO FABRICATION. CAD DOCUMENT WILL BE AVAILABLE FOR USE DURING THE SUBMITTAL PERIOD.

AA 1.0_2



111 SANTA ROSA AVENUE, #300
 SANTA ROSA, CA 95404
 TEL 707.525.5600
 FAX 707.525.5616

WWW.TLCD.COM

PROJECT NAME

**Butte Regional Transit
 Operations Center**

PROJECT ADDRESS

**326 HUSS LANE
 CHICO, CA 95928**

1

EV STALL RELOCATION_1

1" = 30'-0"

NOTE:

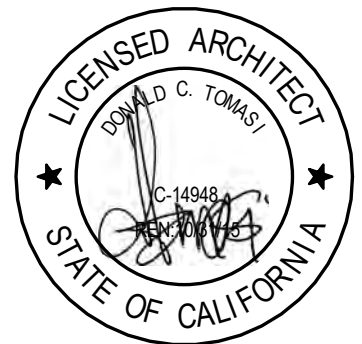
1. DISREGARD ALL LOCATIONS OF EV STALLS ON CIVIL SHEET C1.5. NOTE #7 REMAINS UNCHANGED, TYP.
2. ONE (1) EV STALL ADDED

TLCD PROJECT NO:
 11054.03

DATE:
 07/25/14

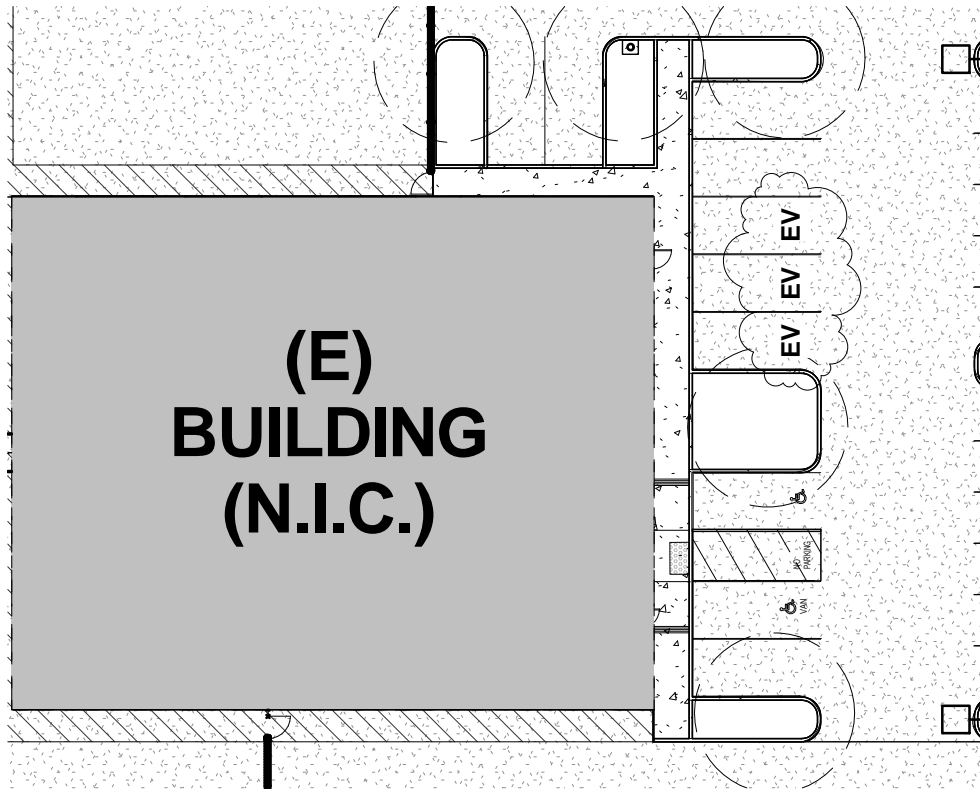
BY:
 KT

DESCRIPTION:
 A1.1 RELOCATION OF
 EFFICIENT VEHICLE
 STALLS



DRAWING NO:

AA 2.0_2



111 SANTA ROSA AVENUE, #300
 SANTA ROSA, CA 95404
 TEL 707.525.5600
 FAX 707.525.5616

WWW.TLCD.COM

PROJECT NAME

**Butte Regional Transit
 Operations Center**

PROJECT ADDRESS

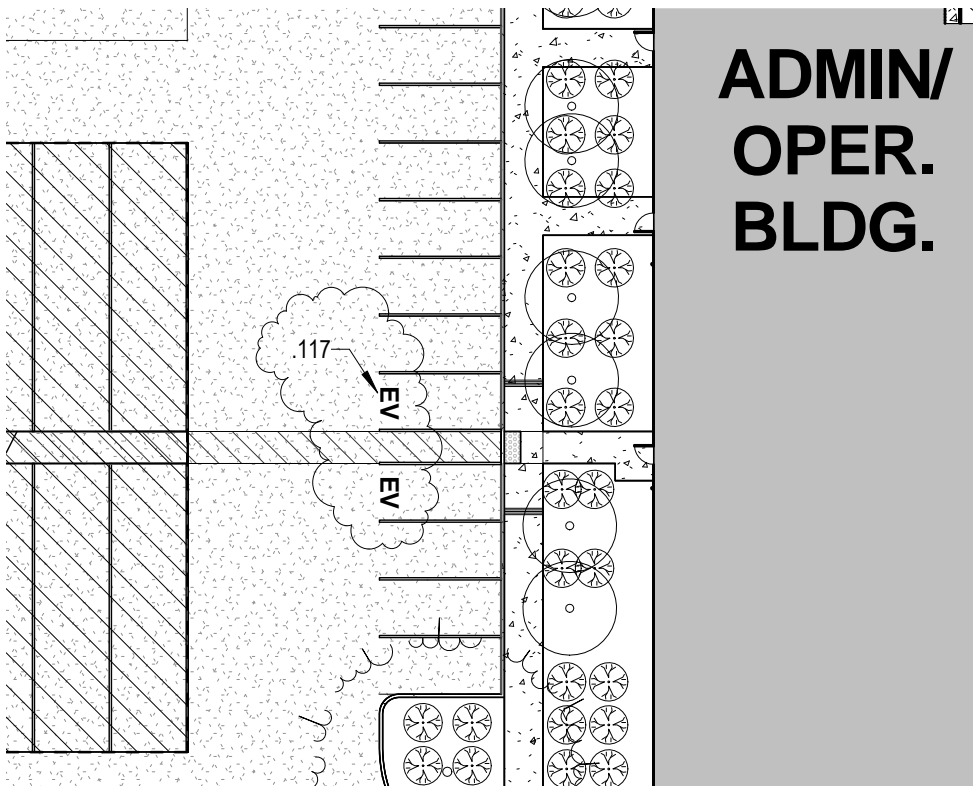
**326 HUSS LANE
 CHICO, CA 95928**

BUS EXIT
 FROM SITE

1

EV STALL RELOCATION_2

1" = 30'-0"

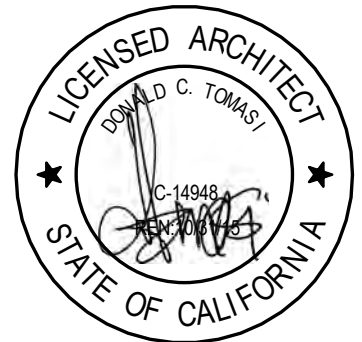


TLCD PROJECT NO:
 11054.03

DATE:
 07/25/14

BY:
 KT

DESCRIPTION:
 A1.1 EFFICIENT
 VEHICLE STALL
 RELOCATION



DRAWING NO:

2

EV STALL RELOCATION_3

1" = 30'-0"

AA 3.0_2

AA 3.0_2 ROOM FINISH SCHEDULE - ADMINISTRATION / OPERATIONS

ROOM NUMBER	ROOM NAME	FLOOR FINISH	BASE	WALL FINISH				CEILING FINISH	COMMENTS
				NORTH	EAST	SOUTH	WEST		
101	DISPATCH (PARATRANSIT)	CARPET TILE	B1	P1	P1	P1	P2	APC1	
102	DISPATCH SUPERVISOR	CARPET TILE	B1	P1	P1	P1	P2	APC1	
103	OPERATIONS MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
104	LOCKERS	CARPET TILE	B1	P1	P1	P1	P1	APC1	
105	CORR.	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
106	DISPATCH VESTIBULE	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
107	DISPATCH (FIXED ROUTE)	CARPET TILE	B1	P1	P1	P1	P1	APC1	
108	COPY / WORK	CARPET TILE	B1	P1	P1	P1	P1	APC1	
109	REPORT WORK AREA	CARPET TILE	B1	P1	P1	P2	P1	APC1	
110	COPY / FILE / WORK	CARPET TILE	B1	P1	P1	P1	P1	APC1	
111	QUIET ROOM	CARPET TILE	B1	P1	P1	P2	P1	APC1	
112	CORRIDOR	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
113	PAYROLL CLERK	CARPET TILE	B1	P1	P1	P2	P1	APC1	
114	SAFETY & TRAINING MANAGER	CARPET TILE	B1	P1	P1	P2	P1	GB1	
115	HUMAN RESOURCES / OFFICE MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
116	VESTIBULE	TILE	TILE	P1	P1	P1	P1	GB1	
117	MEN'S	TILE	TILE	T2	T3	T2	T2	GB1	
118	WOMENS	TILE	TILE	T2	T2	T2	T3	GB1	
119	STOR.	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	
120	JANITOR	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	SEE INT ELEVATIONS FOR EXTENT OF FRP1
121	SAFETY / ROAD SUPERVISORS	CARPET TILE	B1	P1	P1	P2	P1	APC1	
122	KITCHENETTE/ BREAK ROOM	LINOLEUM FLOORING	B1	WC1	P1	P1	P1	APC1	
123	CONFERENCE ROOM 1	CARPET TILE PATTERN	B1	P1	P1	P2	P1	APC1	
124	GENERAL MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
125	RECEPTION (ADMIN. ASSIST) - OPERATIONS	POLISHED CONCRETE	B1	P1	P1	P1	P1	APC1	C1 BEHIND RECEPTION COUNTER, TYP., EXT. FINISH CARPENTRY
126	CORRIDOR	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
127	MECHANICAL ROOM	SEALED CONCRETE	B1	P1	P1	P1	P1	OPEN	NON METALLIC FLOOR HARDENER
128	STOR.	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	
129	MDF	STATIC CONTROL RESILIENT	SEE SPEC	P1	P1	P1	P1	GB1	
130	STOR.	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	
131	ELEC. RM	SEALED CONCRETE	B1	P1	P1	P1	P1	OPEN	NON METALLIC FLOOR HARDENER
132	ACCOUNTING - CHIEF FISCAL OFFICER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
133	KITCHENETTE	LINOLEUM FLOORING	B1	P1	P1	P1	P1	OPEN	
134	COPIER / FAX / PLOTTER	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
135	RECEPTION - ADMIN.	POLISHED CONCRETE	B1	P1	P1	P2	P1	APC1	C1 BEHIND RECEPTION COUNTER, TYP., EXT. FINISH CARPENTRY
136	ACCOUNTING - CLERK	CARPET TILE	B1	P1	P1	P2	P1	APC1	
137	IT OFFICE	CARPET TILE	B1	P1	P1	P2	P1	APC1	
138	B-LINE - TRANSIT PLANNER 2	CARPET TILE	B1	P1	P1	P2	P1	APC1	
139	B-LINE - TRANSIT PLANNER 1	CARPET TILE	B1	P1	P1	P2	P1	APC1	
140	CONFERENCE ROOM 2	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
141	CIRCULATION	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
142	UNISEX SHOWER	TILE	TILE	T2	T2	T2	T2	GB1	
143	WOMEN	TILE	TILE	T2	T2	T3	T2	GB1	
144	CIRCULATION	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
145	MEN	TILE	TILE	T3	T2	T2	T2	GB1	
146	CIRCULATION	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	
147	HCP - PROGRAM MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
148	CORRIDOR	CARPET TILE PATTERN	B1	P1	P1	P1	P1	APC1	T1 AT D.F. AND RECYCLING AREA LOCATIONS
149	ADMINISTRATIVE ASSISTANTS	CARPET TILE	B1	P1	P1	P2	P1	APC1	
150	STOR.	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	
151	STOR.	LINOLEUM FLOORING	B1	P1	P1	P1	P1	GB1	
152	E.O.A. - PERSONNEL MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
153	BCAG PLANNING - GIS SENIOR PLANNER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
154	BCAG PLANNING - PROGRAM MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
155	B-LINE TRANSIT MANAGER	CARPET TILE	B1	P1	P1	P2	P1	APC1	
156	E.O.A. DEPUTY DIRECTOR	CARPET TILE	B1	P1	P1	P2	P1	APC1	



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PROJECT NAME
**Butte Regional Transit
Operations Center**

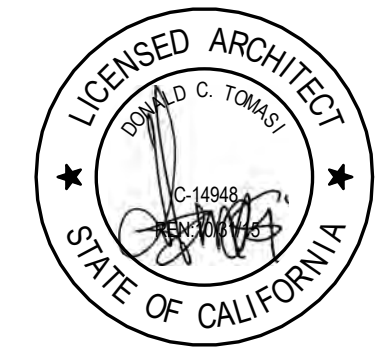
PROJECT ADDRESS
**326 HUSS LANE
CHICO, CA 95928**

TLCD PROJECT NO:
11054.03

DATE:
07/29/14

BY:
KT

DESCRIPTION:
**A3.1 WALL TILE
CLARIFICATION**



DRAWING NO:

AA 4.0_2



111 SANTA ROSA AVENUE, #300
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AA 50_2 ROOM FINISH SCHEDULE - MAINTENANCE

ROOM NUMBER	ROOM NAME	FLOOR FINISH	BASE	WALL FINISH				CEILING FINISH	COMMENTS
				NORTH	EAST	SOUTH	WEST		
201	LUBE/COMPRESSOR ROOM	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
202	FACILITIES MAINTENANCE	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
203	COMMON WORK AREA	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
204	TOOL BOX STOR.	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
205	PORTABLE EQUIPMENT STORAGE 1.	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
206	ELECTRONICS SHOP	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
207	COPY / LIBRARY	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
208	STOR.	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
209	MEN	TILE	TILE	T2	T2	T2	T3	P1	
210	FIRE RISER CLOSET	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
211	WOMEN	TILE	TILE	T2	T3	T2	T2	P1	
212	MECHANICAL ROOM	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
213	ELEC. RM.	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
214	IDF ROOM	STATIC CONTROL RESILIENT	SEE SPEC	P1	P1	P1	P1	HPC1	
215	JANITORIAL	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	SEE INT ELEVATIONS FOR EXTENT OF FRP1, NON METALLIC FLOOR HARDENER
216	BREAK / TRAINING RM.	SEALED CONCRETE	B1	P1	P1	P1	P2	P1	NON METALLIC FLOOR HARDENER
217	PARTS STOREROOM	SEALED CONCRETE	B1	P1	P1	P1	P1	HPC1	NON METALLIC FLOOR HARDENER
218	SHOP SUPERVISOR	SEALED CONCRETE	B1	P2	P1	P1	P1	P1	NON METALLIC FLOOR HARDENER
219	E.O.A. BUILDING MANAGER	SEALED CONCRETE	B1	P2	P1	P1	P1	P1	NON METALLIC FLOOR HARDENER
220	RUNNING REPAIR BAY 3	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
221	RUNNING REPAIR BAY 2	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
222	RUNNING REPAIR BAY 1	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
223	LARGE RUNNING REPAIR BAY	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
224	LARGE RUNNING REPAIR BAY 2	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
225	PROGRAM MAINTENANCE BAY	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
226	CIRCULATION	SEALED CONCRETE	B1	HPC1	HPC1	HPC1	HPC1	P1	NON METALLIC FLOOR HARDENER, EXPOSED DUCTWORK - HPC2
229	MAINTENANCE - EXT. STAIR	SEALED CONCRETE	B1	P1	EXT. PANEL	EXT. PANEL	EXT. PANEL	HPC1	NON METALLIC FLOOR HARDENER
230	MAINTENANCE PIT	SEALED CONCRETE	N/A	HPC1	HPC1	HPC1	HPC1	HPC1	NON METALLIC FLOOR HARDENER
240	MECHANICAL LOFT	SEALED CONCRETE	N/A	EXT. PANEL	EXT. PANEL	P1	EXT. PANEL	HPC1	P1 AT ALL OTHER NON EXT. PANEL WALLS, NON METALLIC FLOOR HARDENER

PROJECT NAME

Butte Regional Transit
Operations Center

PROJECT ADDRESS

326 HUSS LANE
CHICO, CA 95928

TLCD PROJECT NO:

11054.03

DATE:

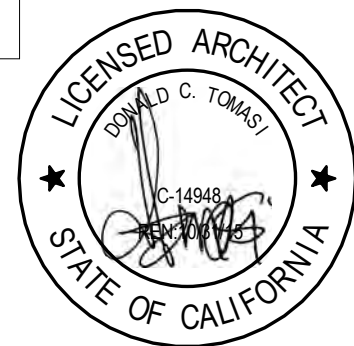
07/29/14

BY:

KT

DESCRIPTION:

A3.1 WALL TILE
CLARIFICATION



DRAWING NO:

AA 5.0_2



111 SANTA ROSA AVENUE, #300
SANTA ROSA, CA 95404
TEL 707.525.5600
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PROJECT NAME

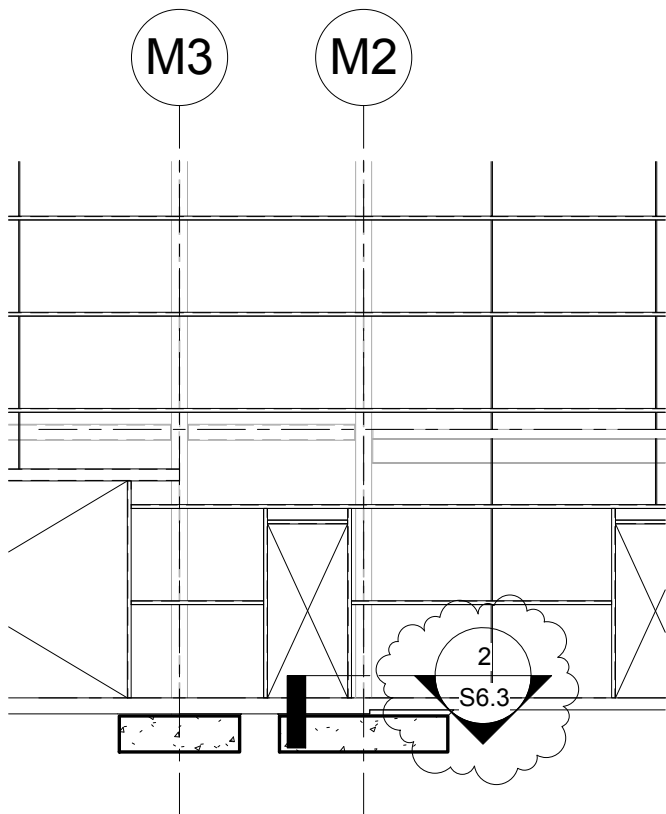
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS

**326 HUSS LANE
CHICO, CA 95928**

MAINTENANCE MECHANICAL LOFT
11' - 2" 

MAINTENANCE FOUNDATION
0' - 0" 



PARTIAL ELEVATION - GRID MJ

TLCD PROJECT NO:

11054

DATE:

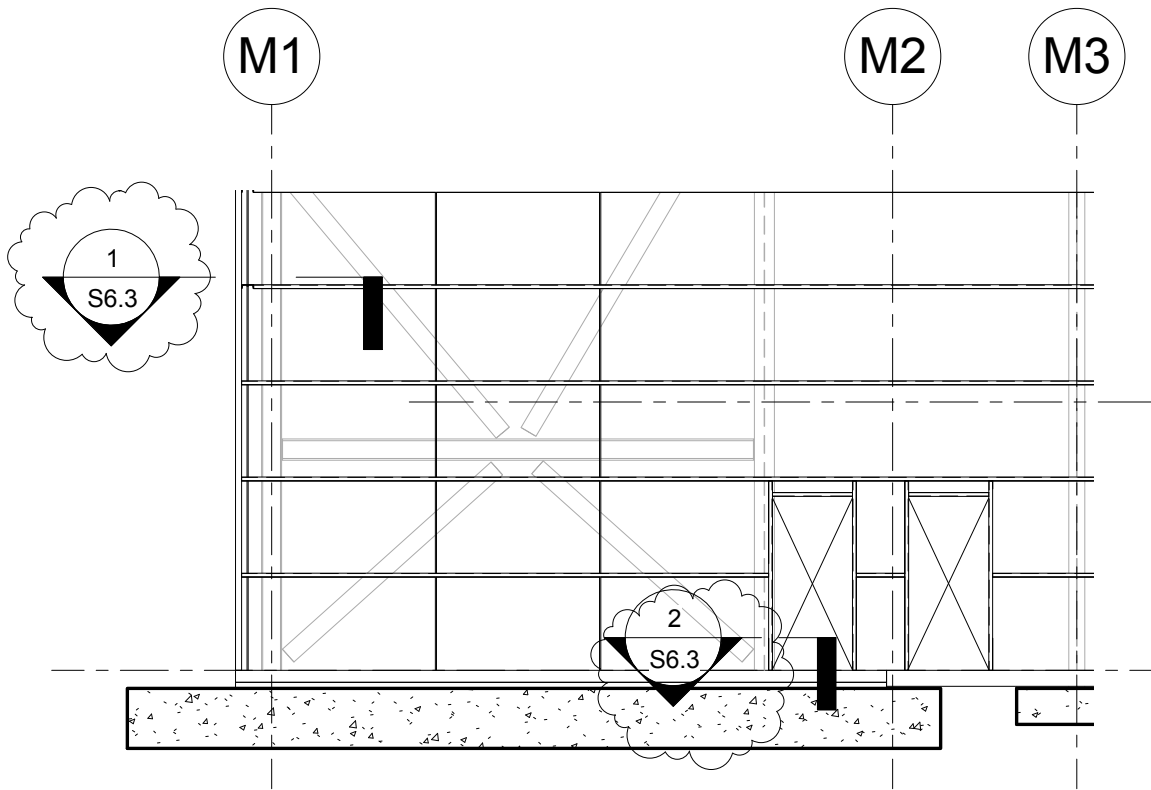
07/18/14

BY:

K. LI

DESCRIPTION:

**MAINTENANCE
BUILDING - FACADE
SUPPORT DETAILS
DRAWING S4.0**



DRAWING NO:

PARTIAL ELEVATION - GRID MA

SA 1.0_2



ARCHITECTURE

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SANTA ROSA, CA 95404
TEL 707.525.5600
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PROJECT NAME

Butte Regional Transit
Operations Center

PROJECT ADDRESS

326 HUSS LANE
CHICO, CA 95928

TLCD PROJECT NO:

11054

DATE:

07/18/14

BY:

K. LI

DESCRIPTION:

MAINTENANCE
BUILDING FACADE
SUPPORT DETAILS
DRAWING S4.0



DRAWING NO:

SA 2.0_2

MF

MG

5/8"Ø ROUND ROD,
TYP.

MAINTENANCE HOIST AND SERV
EQUIPMENT SUPPORT
24' - 0"



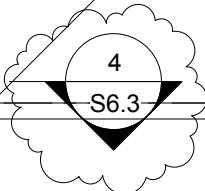
HSS6X6X1/4

HSS6X6X1/4

MAINTENANCE MECHANICAL LOFT
11' - 2"



MAINTENANCE FOUNDATION
0' - 0"

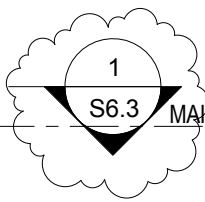
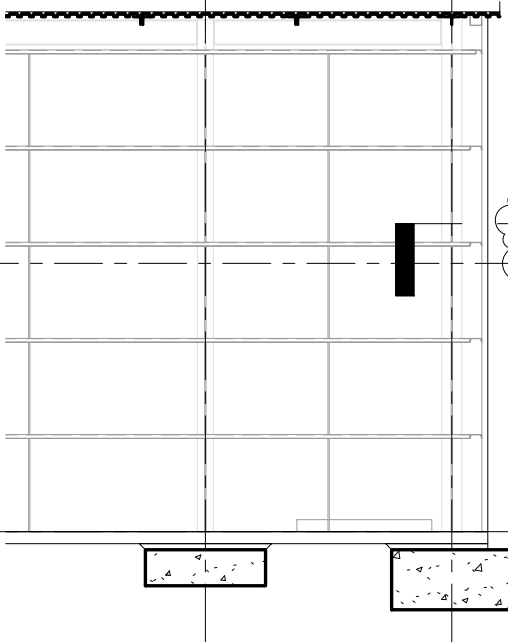


PARTIAL ELEVATION - GRID M6

MB

MA

MAINTENANCE HOIST AND SERVICE
EQUIPMENT SUPPORT
24' - 0"



MAINTENANCE MECHANICAL LOFT
11' - 2"



MAINTENANCE FOUNDATION
0' - 0"



PARTIAL ELEVATION - GRID M1

PROJECT NAME

**Butte Regional Transit
Operations Center**

PROJECT ADDRESS

**326 HUSS LANE
CHICO, CA 95928**



GHD Inc.

2235 Mercury Way, Suite 150
Santa Rosa, California 95407 USA
T 1 707 523 1010 F 1 707 527 8679
W www.ghd.com

TLCD PROJECT NO:

11054.03

DATE:

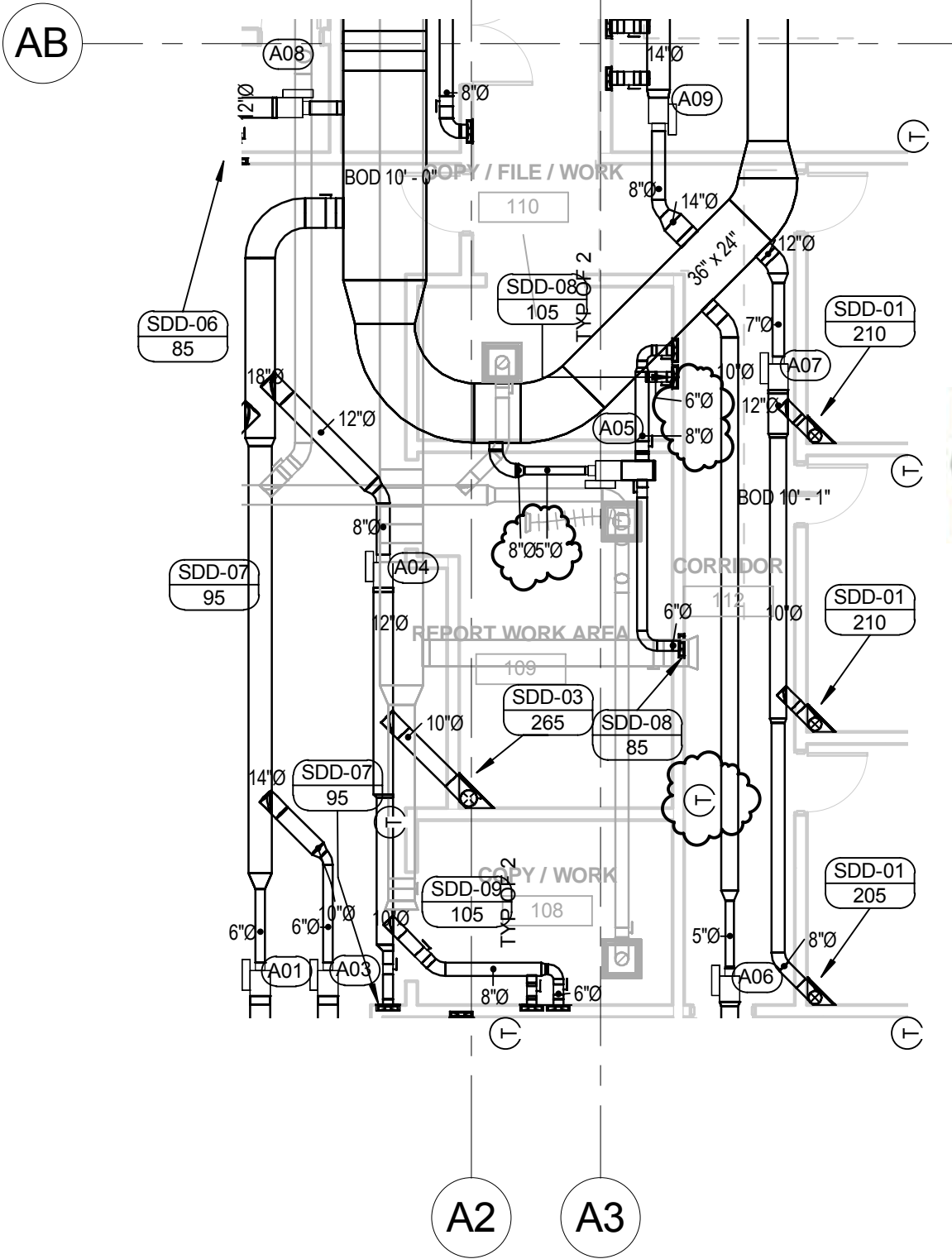
07/31/14

BY:

Author

DESCRIPTION:

**ADDED DUCT SIZE
TAGS AND T-STAT M2.1**



John [Signature]

MA1.0_2

**ADMINISTRATION / OPERATIONS HVAC -
SUPPLY**

1

1/8" = 1'-0"

PROJECT NAME
Butte Regional Transit
Operations Center

PROJECT ADDRESS
326 HUSS LANE
CHICO, CA 95928



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11054.03

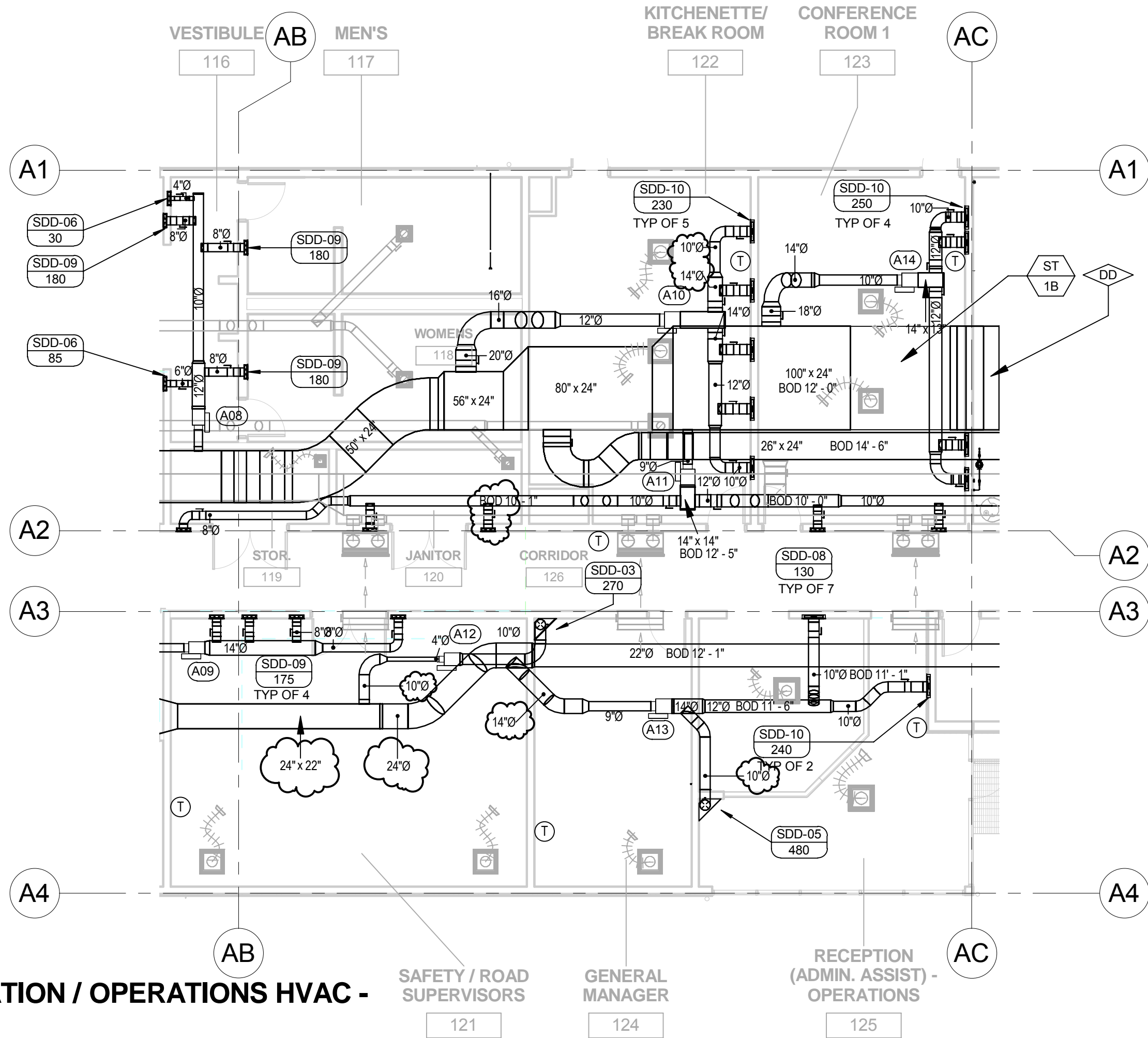
DATE:
07/31/14

BY:
Author

DESCRIPTION:
ADDED DUCT SIZE
TAGS M2.1



Daniel Boyd Reiter
MA2.0_2



ADMINISTRATION / OPERATIONS HVAC - SUPPLY

PROJECT NAME
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS
**326 HUSS LANE
CHICO, CA 95928**



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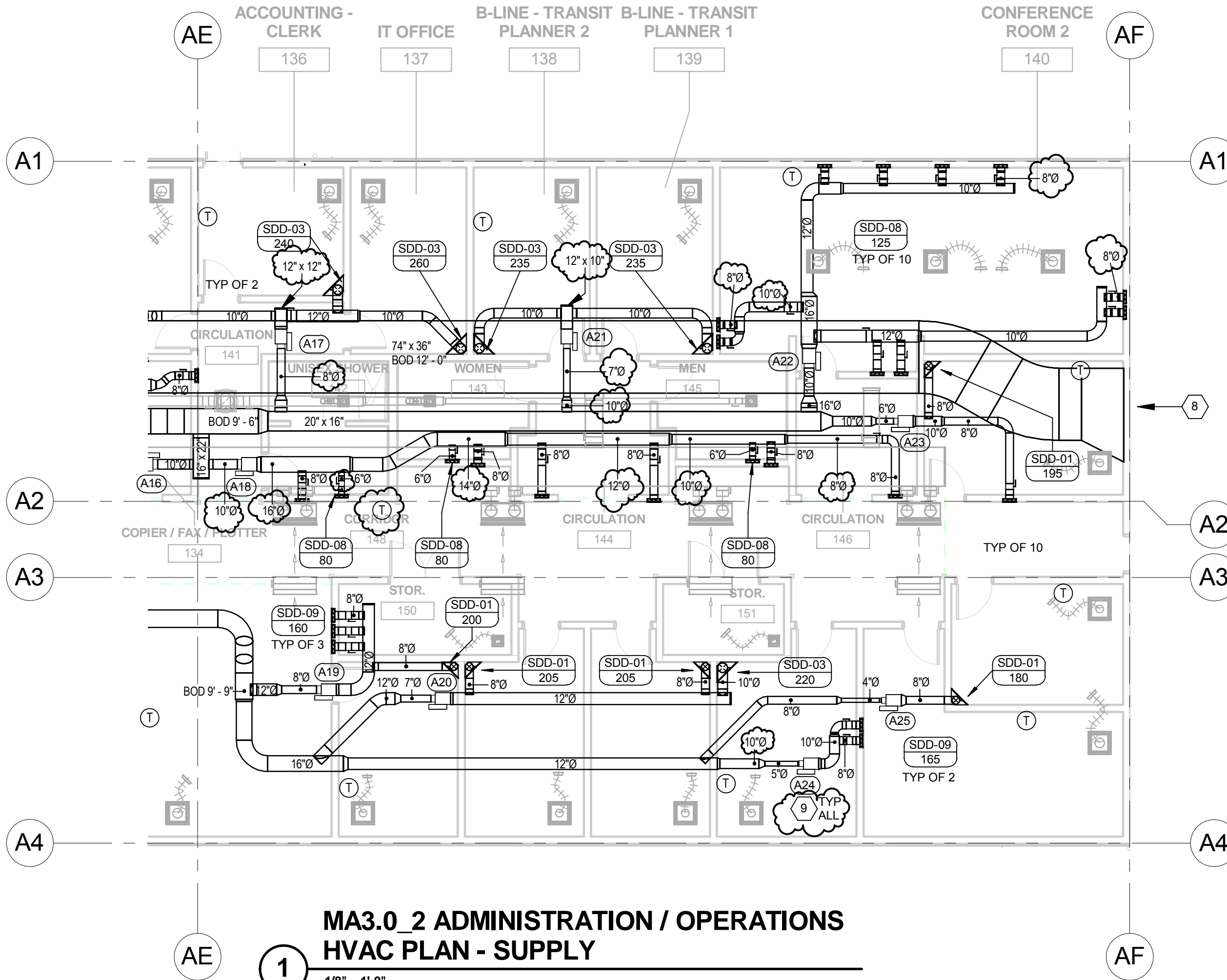
DATE:
07/31/14

BY:
Author

DESCRIPTION:
**ADDED DUCT SIZE
TAGS AND T-STAT M2.1**



Daniel Boyd Reiter
MA3.0_2



1

**MA3.0_2 ADMINISTRATION / OPERATIONS
HVAC PLAN - SUPPLY**

1/8" = 1'-0"

PROJECT NAME
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS
**326 HUSS LANE
CHICO, CA 95928**



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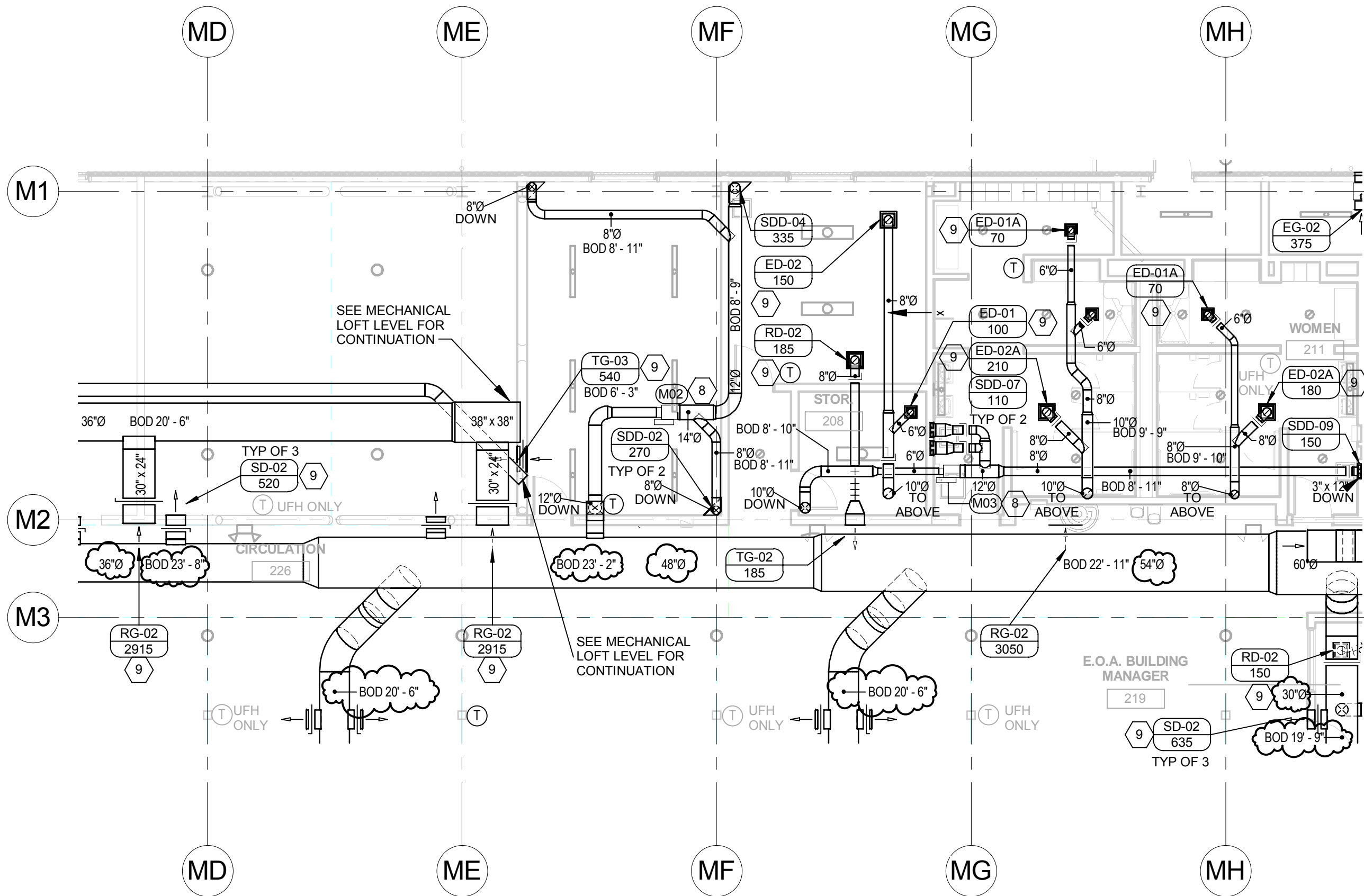
DATE:
07/31/14

BY:
Author

DESCRIPTION:
**DUCT SIZES CHANGED
TO READILY
AVAILABLE SIZES M2.3**



Daniel Boyd Reiter
MA4.0_2



1 MAINTENANCE HVAC PLAN - FIRST FLOOR
1/8" = 1'-0"

PROJECT NAME

Butte Regional Transit
Operations Center

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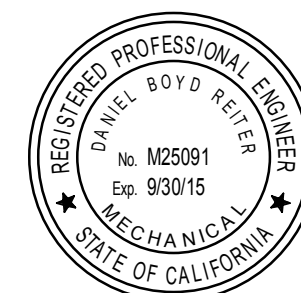
07/31/14

BY:

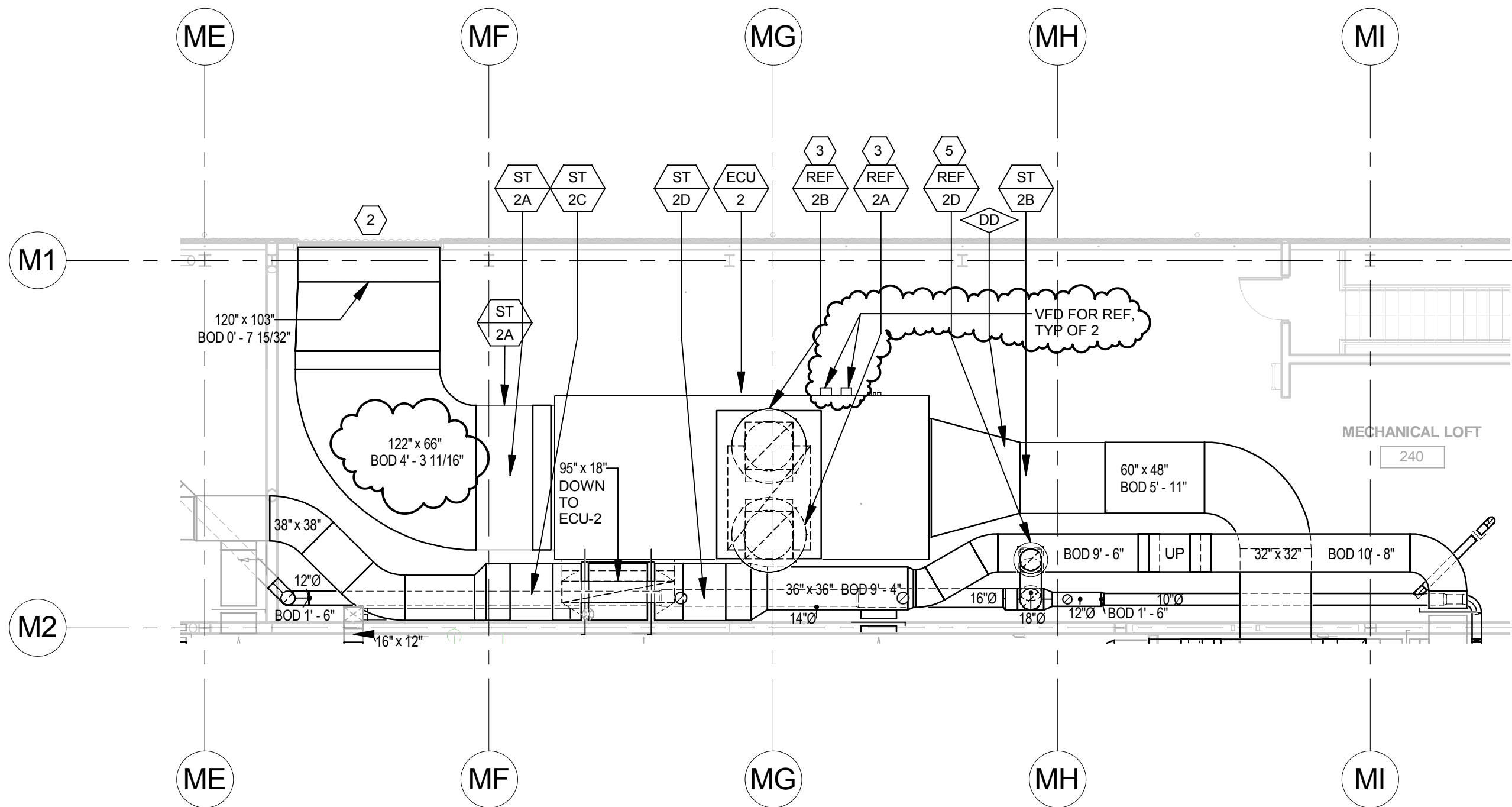
Author

DESCRIPTION:

ADDED VFD LOCATION
M2.3



Daniel Boyd Reiter
MA5.0_2



**MAINTENANCE HVAC PLAN - MECHANICAL
LOFT**

1

1/8" = 1'-0"

PROJECT NAME
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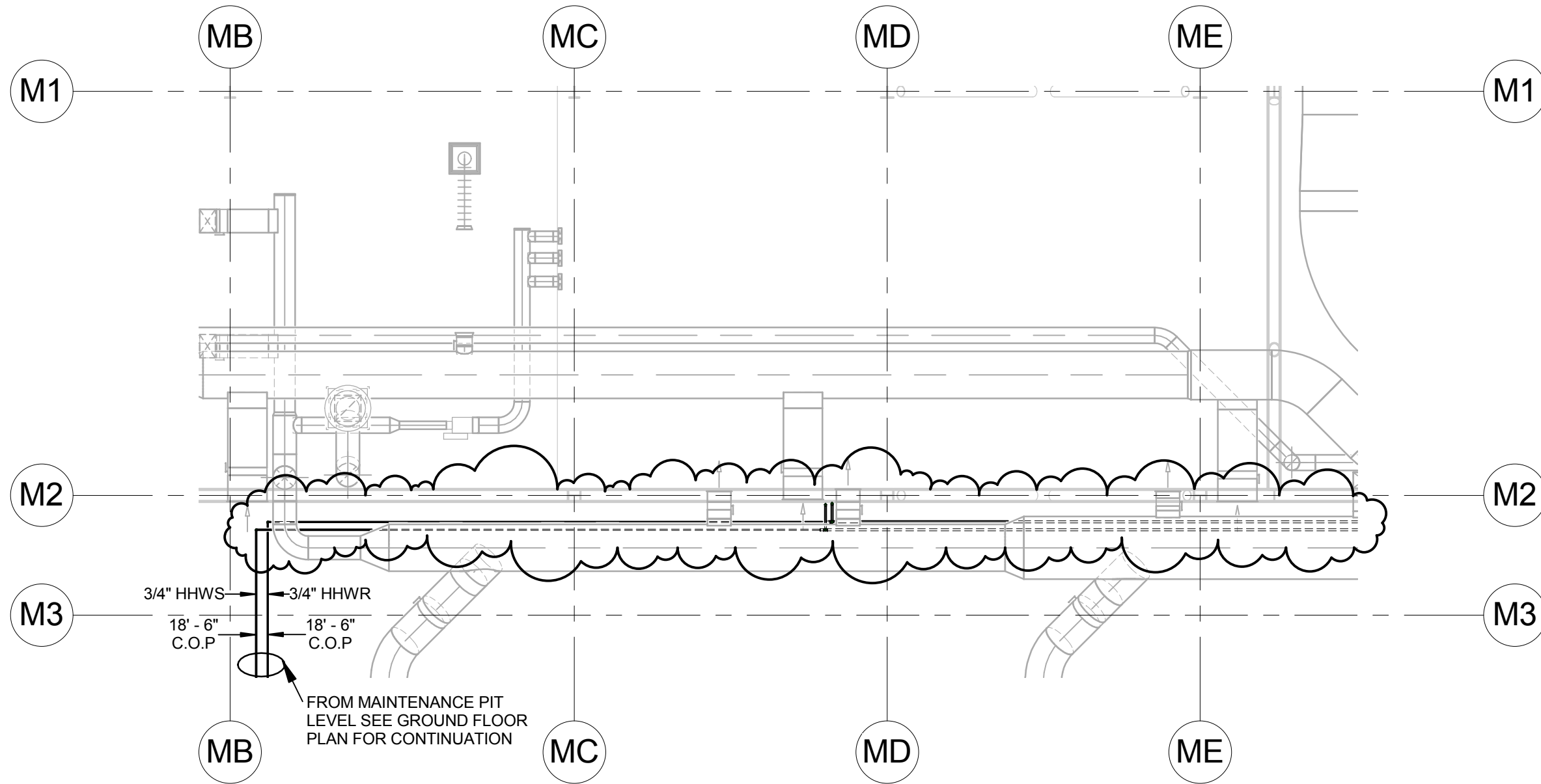
DATE:
08/01/14

BY:
JD

DESCRIPTION:
**HYDRONIC PIPING -
DRAWING M2.4**



Daniel Boyd Reiter
MA5.1_2



**MAINTENANCE HYDRONIC PLAN -
MECHANICAL LOFT**

1
1/8" = 1'-0"

PROJECT NAME
**Butte Regional Transit
Operations Center**

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CHICO, CA 95928**



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2235 Mercury Way, Suite 150
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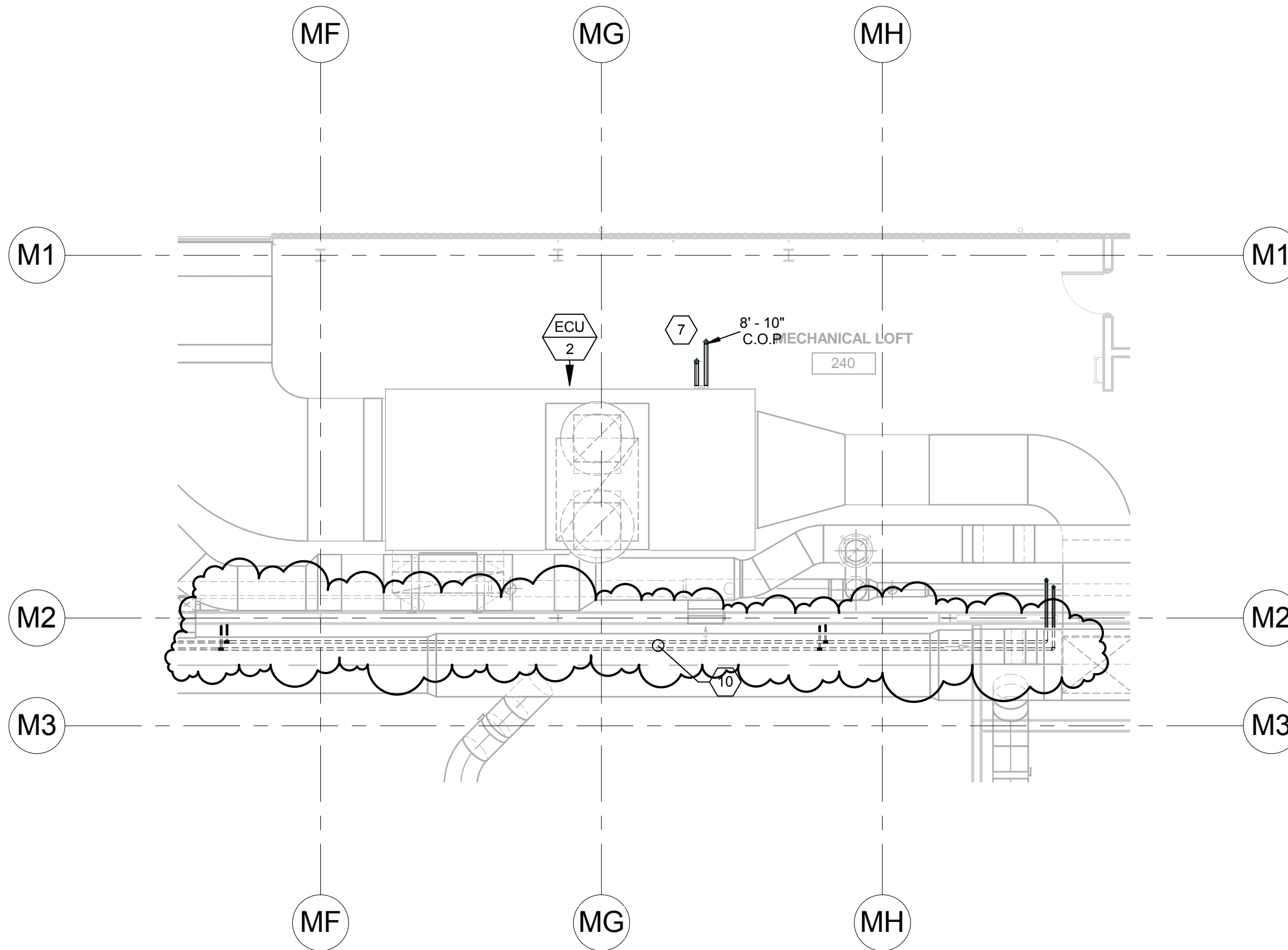
DATE:
08/01/14

BY:
JD

DESCRIPTION:
**HYDRONIC PIPING -
DRAWING M2.4**



Daniel Boyd Reiter
MA5.2_2



**MAINTENANCE HYDRONIC PLAN -
MECHANICAL LOFT**

1

1/8" = 1'-0"

PROJECT NAME

Butte Regional Transit
Operations Center

PROJECT ADDRESS

326 HUSS LANE
CHICO, CA 95928



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Santa Rosa, California 95407 USA
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DATE:

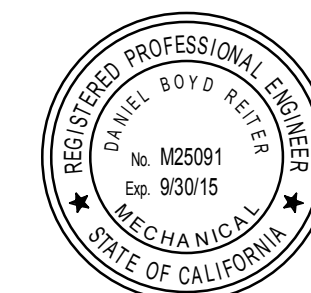
07/31/14

BY:

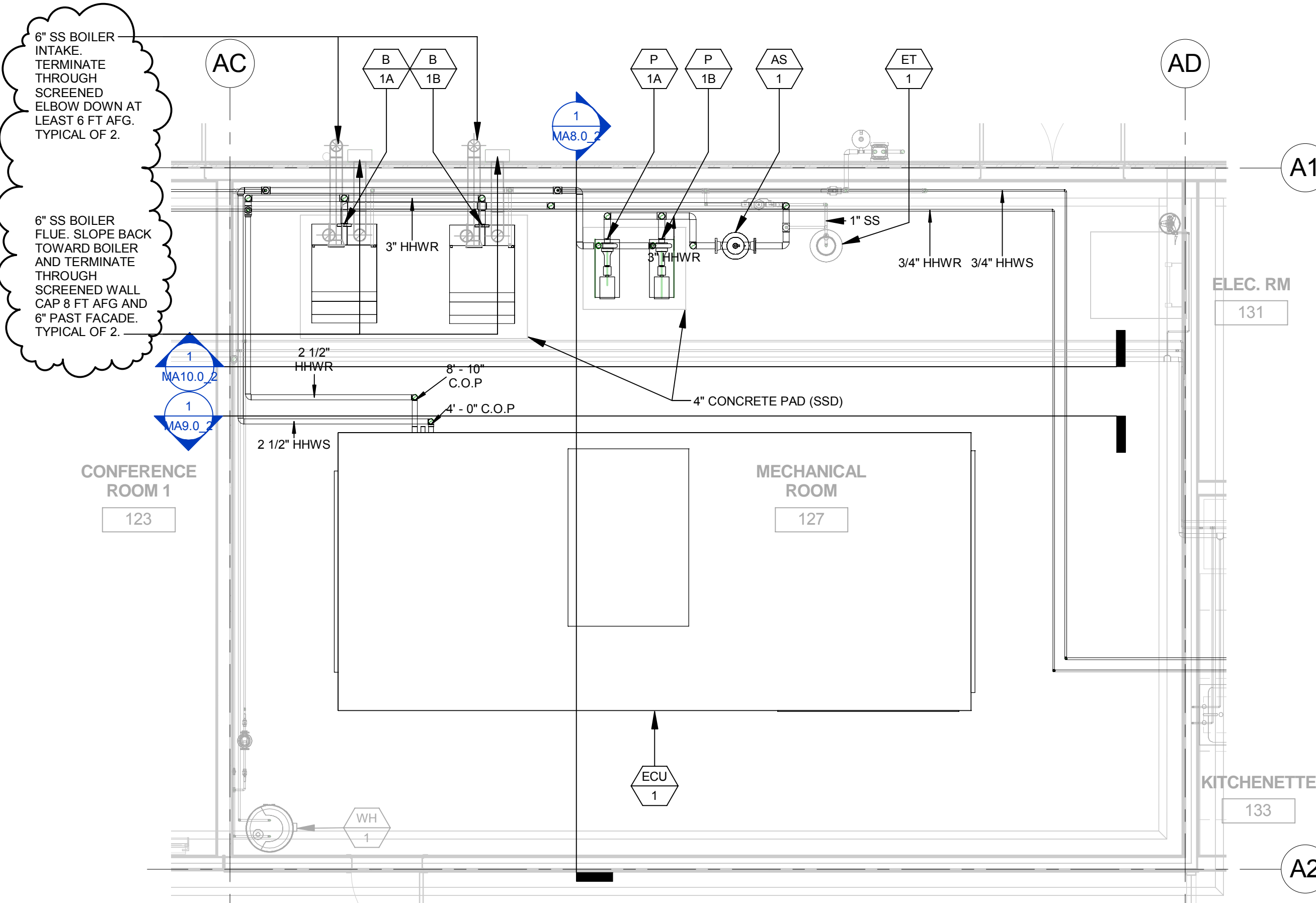
Author

DESCRIPTION:

ADMINISTRATION
BOILER FLUE NOTES
M4.1

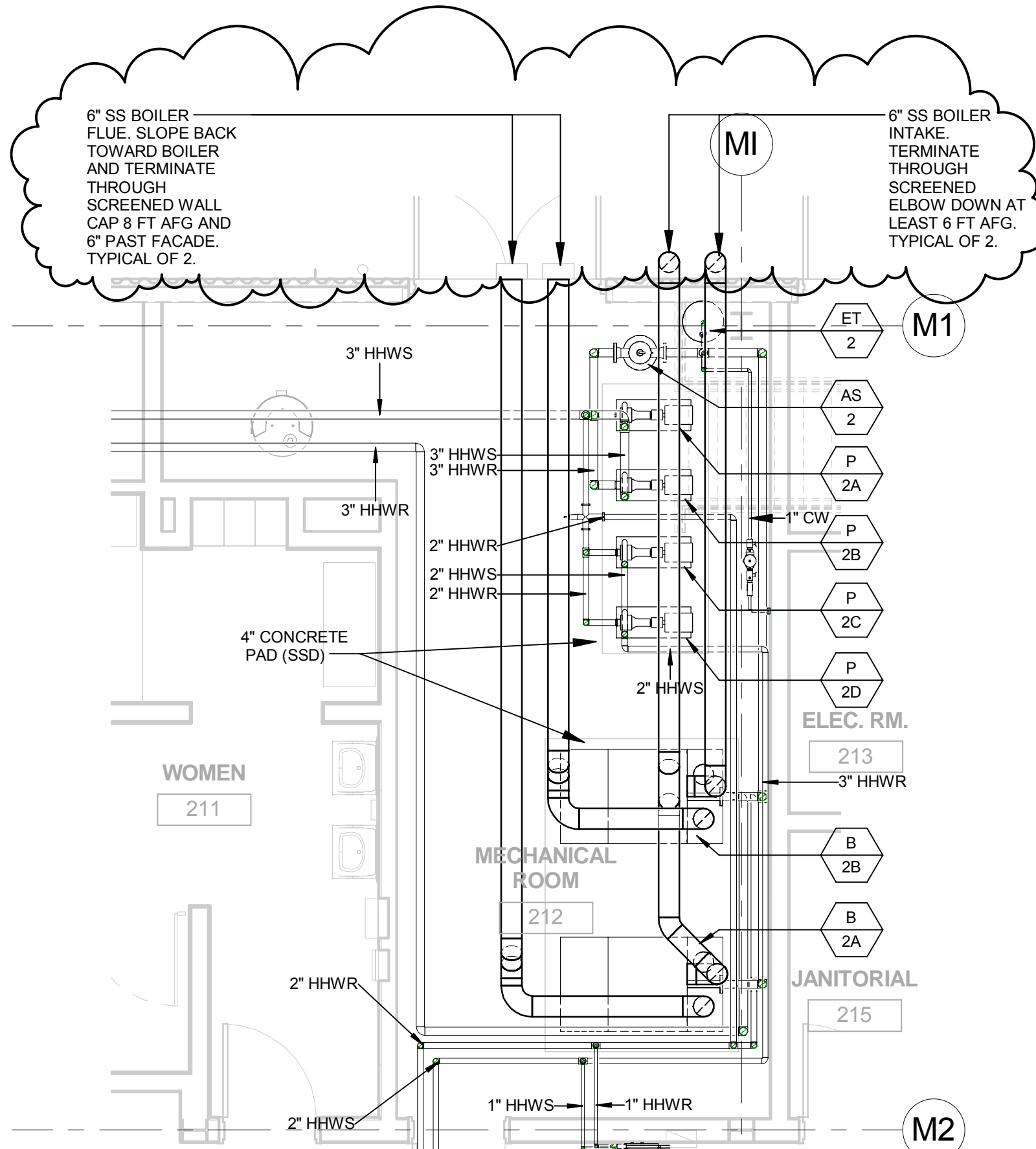


Daniel Boyd Reiter
MA6.0_2



ENLARGED HYDRONIC PIPING PLAN - ADMIN / OPS

1
1/4" = 1'-0"



ENLARGED HYDRONIC PIPING PLAN - MAINTENANCE

1

1/4" = 1'-0"



PROJECT NAME
Butte Regional Transit Operations Center

PROJECT ADDRESS
**326 HUSS LANE
 CHICO, CA 95928**



GHD Inc.
 2235 Mercury Way, Suite 150
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TLCD PROJECT NO:
 11054.03

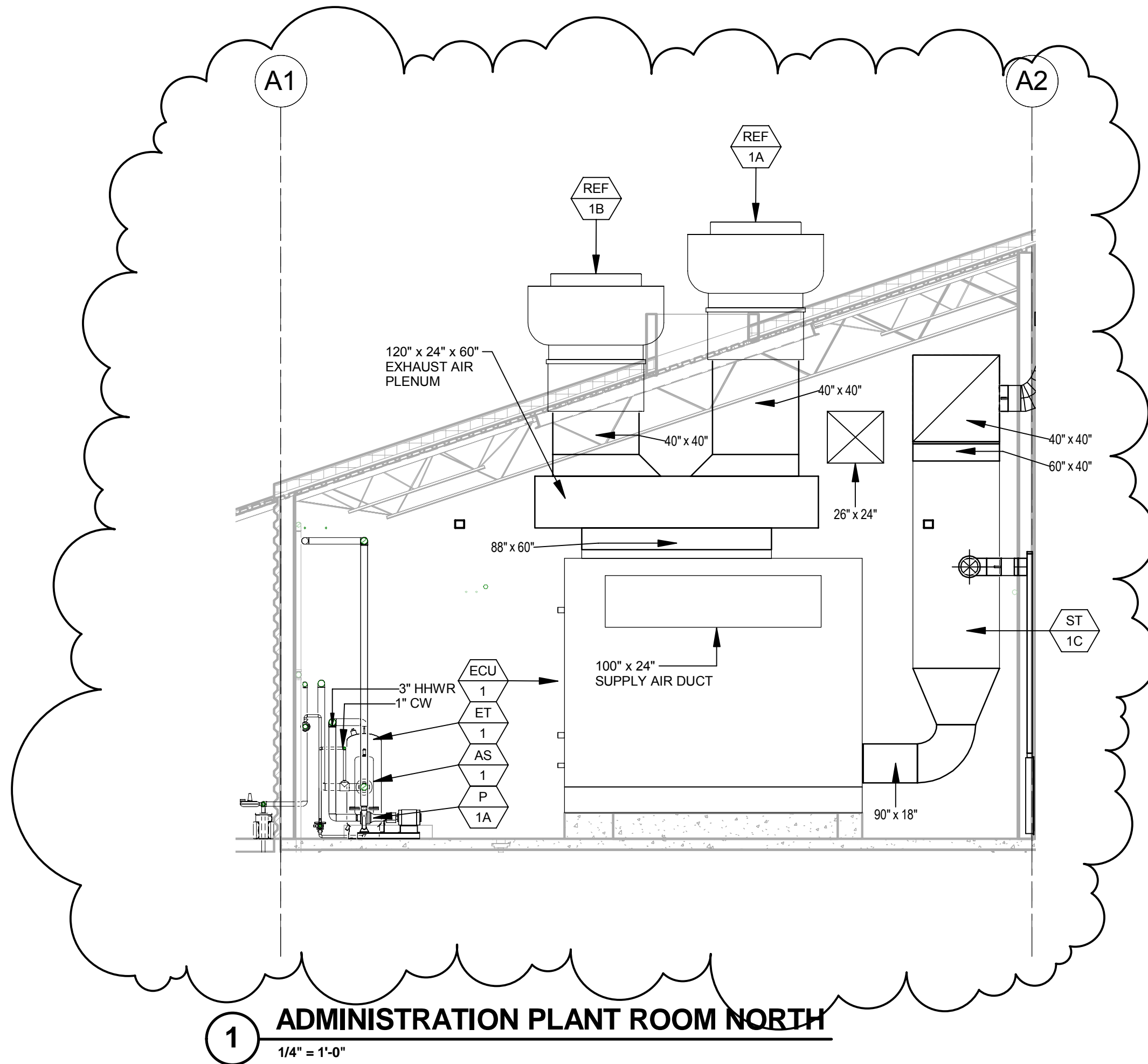
DATE:
 07/31/14

BY:
 Author

DESCRIPTION:
**BOILER FLUE NOTES
 M4.1**



Daniel Boyd Reiter
MA7.0_2



1 ADMINISTRATION PLANT ROOM NORTH
 1/4" = 1'-0"

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 Operations Center**

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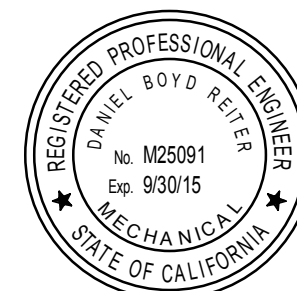
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DATE:
07/31/14

BY:
Author

DESCRIPTION:
**ADMIN PLANT ROOM
 SECTIONS**



Daniel Boyd Reiter
MA8.0_2

PROJECT NAME

Butte Regional Transit
Operations Center

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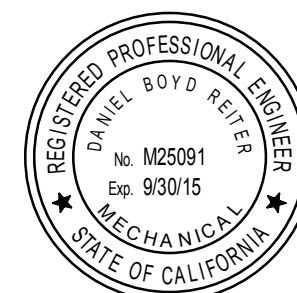
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BY:

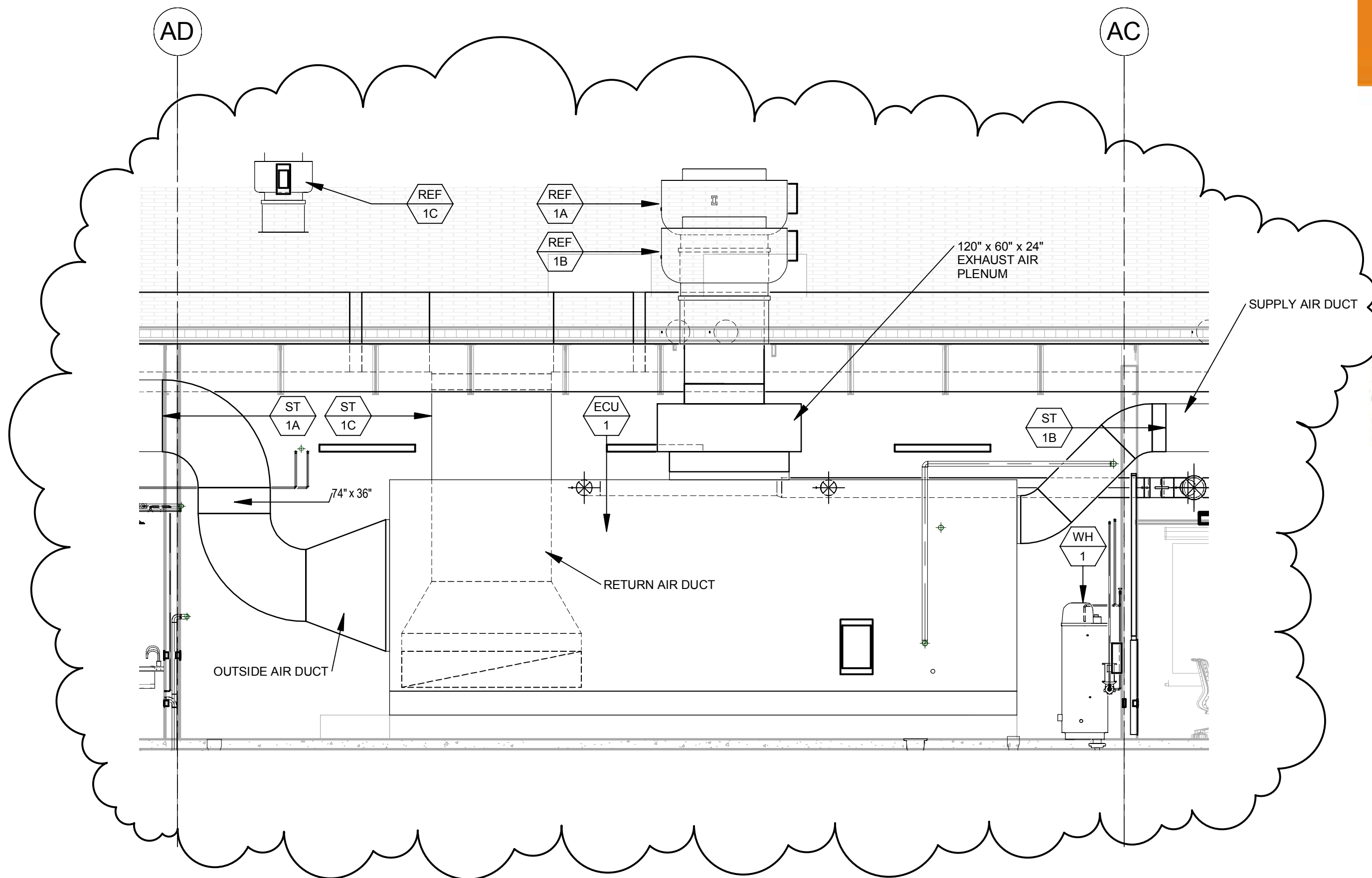
Author

DESCRIPTION:

ADMIN PLANT ROOM
SECTION EAST



Daniel Boyd Reiter
MA9.0_2



1

ADMINISTRATION PLANT ROOM EAST

1/4" = 1'-0"

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**Butte Regional Transit
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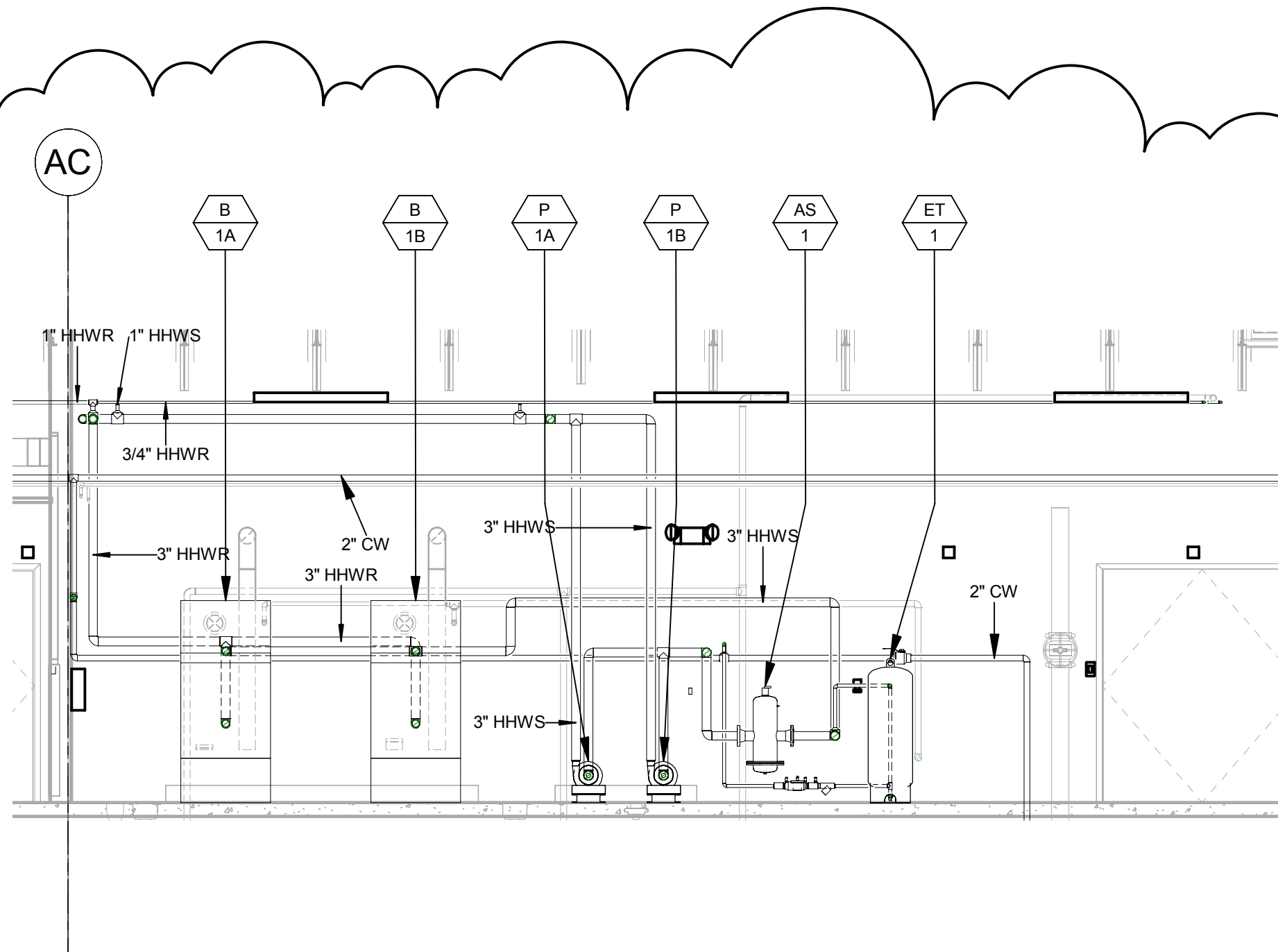
DATE:
07/31/14

BY:
Author

DESCRIPTION:
**ADMIN PLANT ROOM
WEST WALL**



Daniel Boyd Reiter
MA10.0_2



1 ADMINISTRATION PLANT ROOM WEST WALL
1/4" = 1'-0"

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Butte Regional Transit
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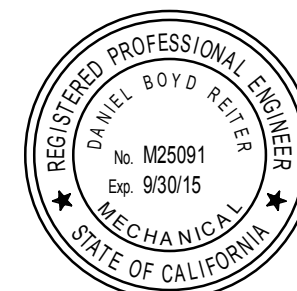
07/31/14

BY:

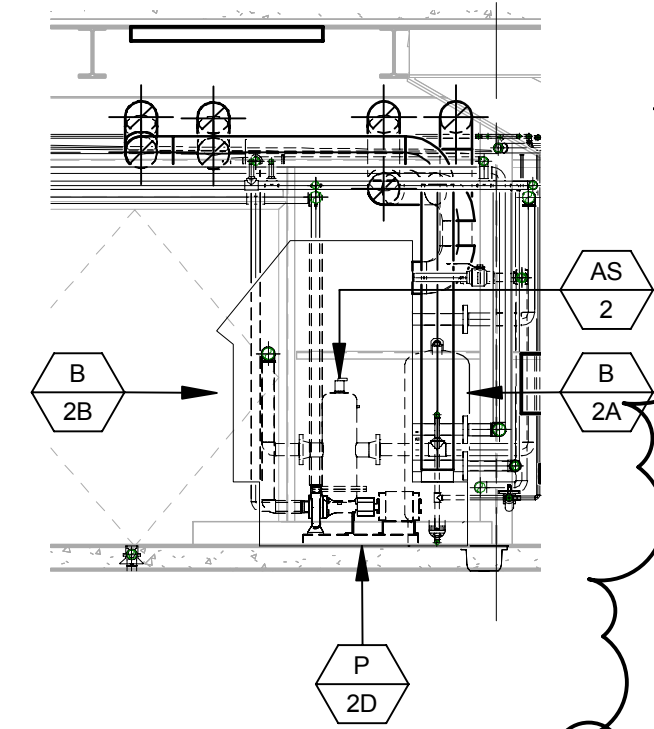
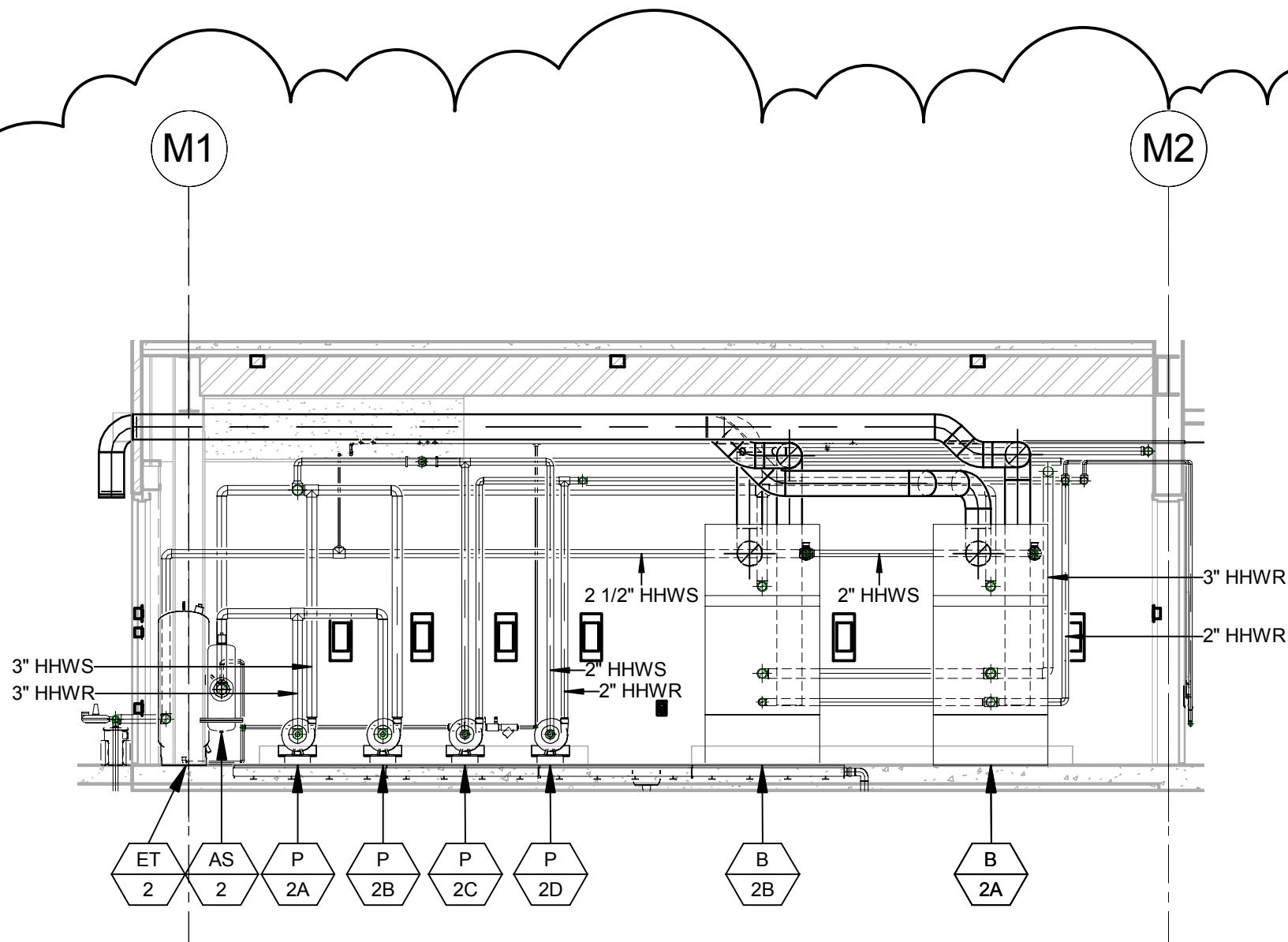
Author

DESCRIPTION:

MAINTENANCE PLANT
ROOM EAST AND
NORTH



Daniel Boyd Reiter
MA11.0_2



1 MAINTENANCE PLANT ROOM EAST WALL
1/4" = 1'-0"

2 MAINTENANCE PLANT ROOM NORTH
1/4" = 1'-0"

CHANGES TO KEY NOTES FOR IDEC UNITS, ADDED 17-21

ECU IDEC PERFORMANCE SCHEDULE															
KEYNOTE	UNIT	OUTSIDE AIR			RETURN AIR			OA+ FAN HEAT		AFTER IEC			AFTER DEC		
		DB	WB	CFM	DB	WB	CFM	DB	WB	DB	WB	WBDE	DB	WB	WBDE
18	ECU-1	100.0	70.0	18000	75.0	63.0	16280	102.3	70.8	70.8	62.5	65%	64.0	62.5	90%
20	ECU-2	100.0	70.0	23000	75.0	63.0	21600	102.8	70.7	75.5	62.1	68%	63.4	62.1	90%

ECU WINTER HEAT RECOVERY PERFORMANCE							
KEYNOTE	UNIT	OUTSIDE AIR		RETURN AIR		AFTER HX	
		DB	CFM	DB	CFM	DB	EFF
18	ECU-1	27.0	18000	70.0	16280	46.4	45%
20	ECU-2	27.0	23000	70.0	21600	47.2	47%

1. SINGLE PIECE UNIT.
2. 12" HIGH CURB.
3. 2" ACOUSTICAL PERFORATED CASE LINING IN ALL SECTIONS EXCEPT DIRECT EVAPORATIVE COOLING SECTION.
4. FACE AND BYPASS DAMPERS DOWNSTREAM OF THE SUPPLY FAN BY MANUFACTURER.
5. PREMIUM EFFICIENCY SUPPLY FAN MOTOR.
6. PROVIDE SMOKE DETECTOR IN SUPPLY DUCT, CONNECT FOR UNIT SHUTDOWN, FIRE ALARM SYSTEM MONITORING BY DIVISION 26.
7. ALL DRAINS TO BE INDIVIDUALLY TRAPPED.
8. 30 TO 40 PSI MAXIMUM POTABLE WATER SUPPLY PRESSURE.
9. EVAPORATIVE COOLING WATER PUMPS AND CONTROLS BY MANUFACTURER.
10. VALVE FOR SUMP LEVEL CONTROL BY MANUFACTURER.
11. DIRECT/INDIRECT SUMP DRAIN AND FILL SOLENOIDS SHIPPED LOOSE FOR FIELD INSTALLATION AND WIRING BY CONTRACTOR.
12. MANUFACTURER SUPPLIED HOT WATER CONTROL VALVE SHIPPED LOOSE FOR FIELD INSTALLATION AND WIRING BY CONTRACTOR.
13. INDIRECT SECTION IS EXHAUSTED BY ROOFTOP EXHAUST FANS (REF), UNIT SHALL BE INTERLOCKED TO REF.
14. CONTROLS PACKAGE INCLUDING AVERAGING THERMOSTATS, UNIT CONTROL PANEL WITH LCD DISPLAY, AND REMOTE MONITORING/ ADJUSTING WITH LCD DISPLAY WHERE SHOWN ON PLANS BY MANUFACTURER. WIRING BETWEEN UNIT CONTROL PANELS AND REMOTE CONTROL PANELS BY CONTRACTOR PER MANUFACTURERS RECOMMENDATIONS.
15. PROVIDE A SINGLE POINT POWER SUPPLY TO MANUFACTURERS ELECTRICAL PANEL. LOW VOLTAGE TRANSFORMER IN PANEL FOR LIGHTS AND CONTROLS PROVIDED BY MANUFACTURER.
16. ON BOARD BACKUP DX REFRIGERATION COOLING SECTION INCLUDED.
17. PROVIDE VFD FOR SUPPLY AND EXHAUST FANS IN ECU, BASIS OF DESIGN MANUFACTURER IS ABB.

CHANGES TO KEY NOTES FOR EXHAUST FAN UNITS, ADDED 17-21

1. BACKDRAFT DAMPER.
2. ROOF CURB.
3. BIRD SCREEN.
4. INTERLOCK TO HVAC SUPPLY FAN SERVED.
5. OPERATIONAL DURING OCCUPIED HOURS.
6. PROVIDE VFD MOUNTED IN ECU, BASIS OF DESIGN MANUFACTURER IS ABB.
7. OPERATIONAL DURING BUS WASHING.
8. EXPLOSION RESISTANT CONSTRUCTION AMCA-B.
9. CONTROL ON THERMOSTAT.



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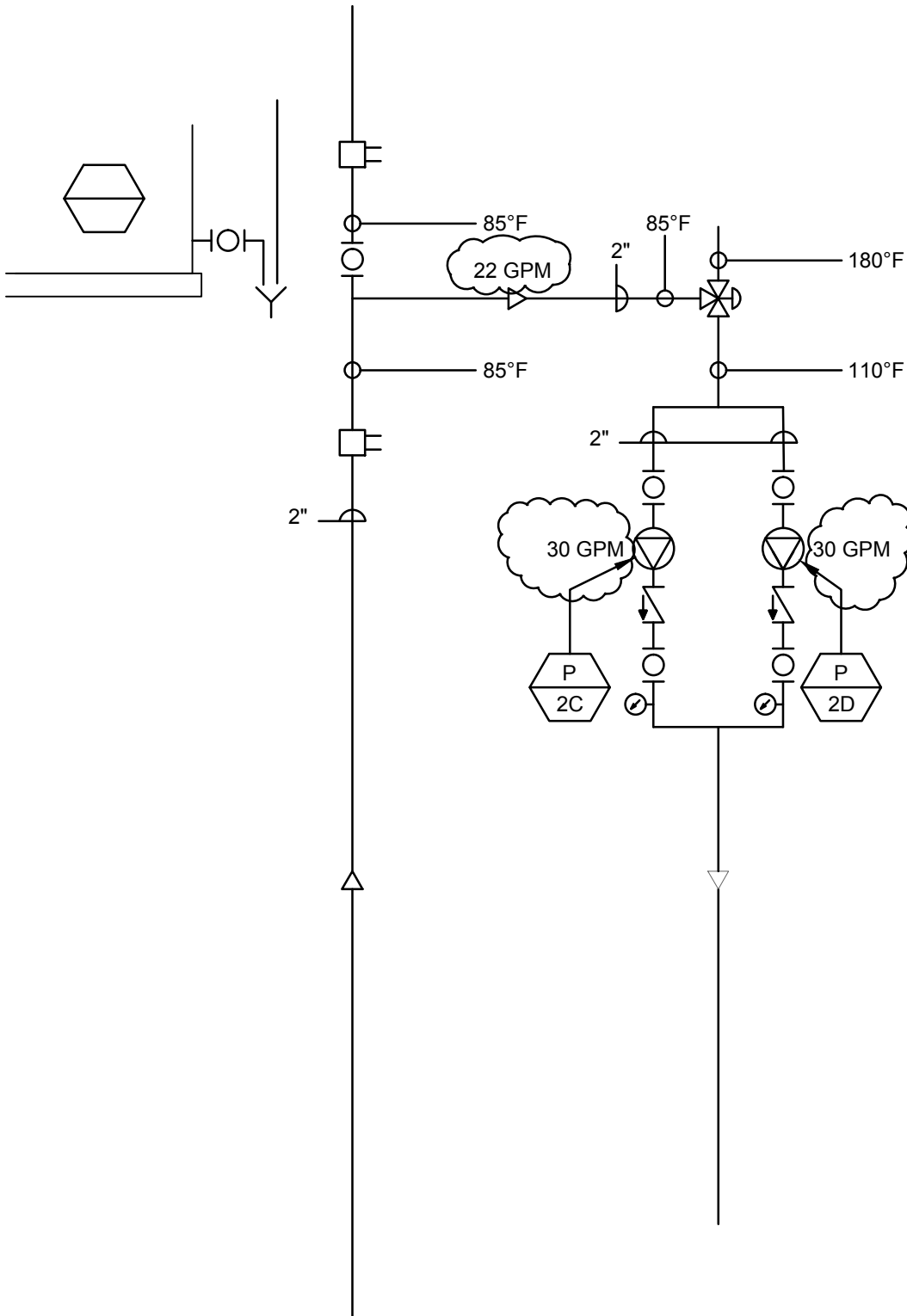
DATE:
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BY:
Author

DESCRIPTION:
NEW AND MODIFIED
KEYNOTES FROM
SHEET M6.3



Daniel Boyd Reiter
MA12.0_2



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DATE:

07/31/14

BY:

JD

DESCRIPTION:

PUMP FLOW
 CORRECTION -
 DRAWING M6.2



Handwritten signature of Daniel Boyd Reiter

MA13.0_2

PROJECT NAME

**Butte Regional Transit
Operations Center**

PROJECT ADDRESS

**326 HUSS LANE
CHICO, CA 95928**

GENERAL PLUMBING NOTES

1. THESE DRAWINGS ARE BASED UPON AVAILABLE DOCUMENTS, WHICH MAY NOT ACCURATELY PORTRAY AS-BUILT CONDITIONS. EXISTING EQUIPMENT AND PIPING SIZES, LOCATIONS, AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO DEMOLITION AND CONSTRUCTION. NOTIFY THE ENGINEER IMMEDIATELY OF ALL DISCREPANCIES AFFECTING THE REMOVAL OF EXISTING EQUIPMENT AND PIPING, AND THE INSTALLATION OF NEW EQUIPMENT AND PIPING.
2. INSTALL PIPING AND DUCTWORK TO BEST SUIT FIELD CONDITIONS AND COORDINATE WITH THE INSTALLATION WORK OF OTHER TRADES. THESE DRAWINGS ARE DIAGRAMMATIC, DO NOT SCALE TO DETERMINE EXACT LOCATION OF PIPING.
3. FOR ALL MECHANICAL SYSTEMS CONTROLS, PROVIDE CONDUIT AND WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS AND MANUFACTURER'S REQUIREMENTS.
4. ALL SANITARY AND SANITARY VENT PIPING SHALL SLOPE AT ¼" PER 12" UNLESS OTHERWISE NOTED.
5. ALL DOMESTIC WATER PIPE SIZES BASED ON TYPE L COPPER.
6. ALL PIPING TO BE SUPPORTED AND BRACED PER 2013 CALIFORNIA BUILDING CODE.
7. ALL PIPING IN WALL STUDS SHALL BE ISOLATED TO PREVENT VIBRATION AND NOISE TRANSMISSION.
8. ALL HW, HWR AND CW PIPING IS LOCATED ABOVE GRADE EXCEPT WHERE NOTED OTHERWISE.
9. ALL SS PIPING IS LOCATED BELOW GRADE EXCEPT INDIVIDUAL SS LINES OFF ABOVE GRADE FIXTURES OR SHOWN OTHERWISE IN SECTIONS & ELEVATIONS.
10. ALL VENT PIPING IS LOCATED ABOVE GRADE EXCEPT INDIVIDUAL VENTS OFF FLOOR MOUNTED FIXTURES.



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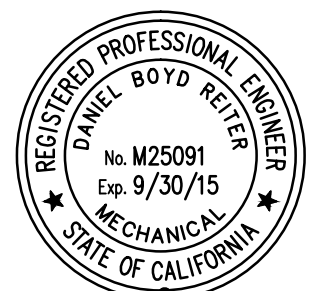
07/31/14

BY:

SS

DESCRIPTION:

**GENERAL PLUMBING
NOTES - DRAWING P0.1**



A handwritten signature in black ink, appearing to read "Daniel Boyd Reiter".

PA1.0_2

PROJECT NAME

**Butte Regional Transit
Operations Center**

PROJECT ADDRESS

**326 HUSS LANE
CHICO, CA 95928**



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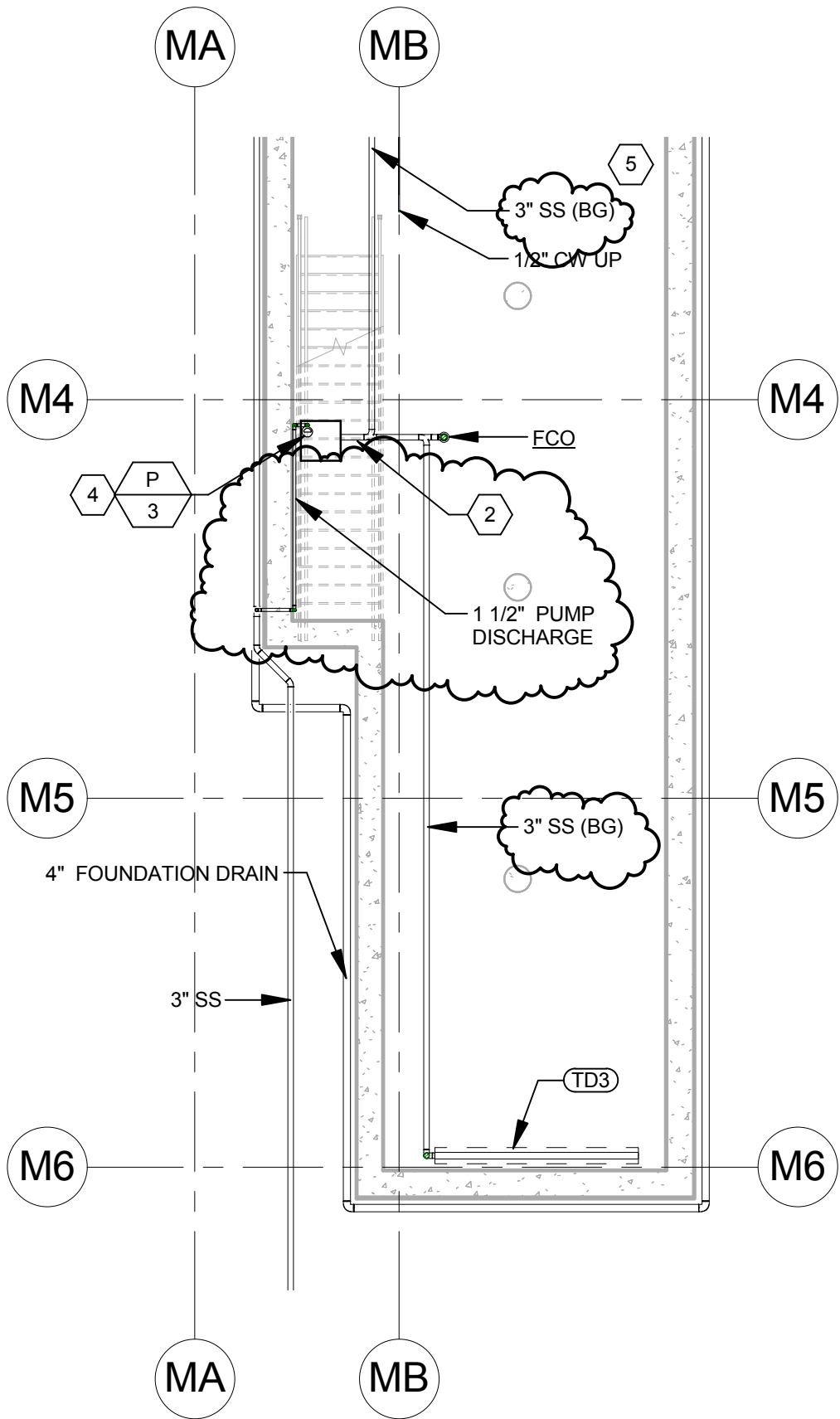
07/31/14

BY:

SS

DESCRIPTION:

**PIT PUMP PIPING
OFFSET - DRAWING
P2.2**



1

MAINTENANCE PLUMBING PLAN - PIT

1/8" = 1'-0"



Daniel Boyd Reiter
PA2.0_2

PROJECT NAME
**Butte Regional Transit
Operations Center**

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**326 HUSS LANE
CHICO, CA 95928**



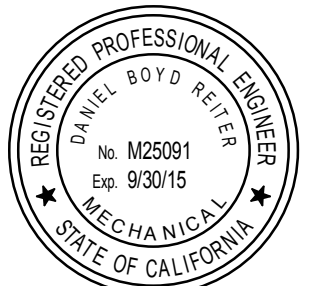
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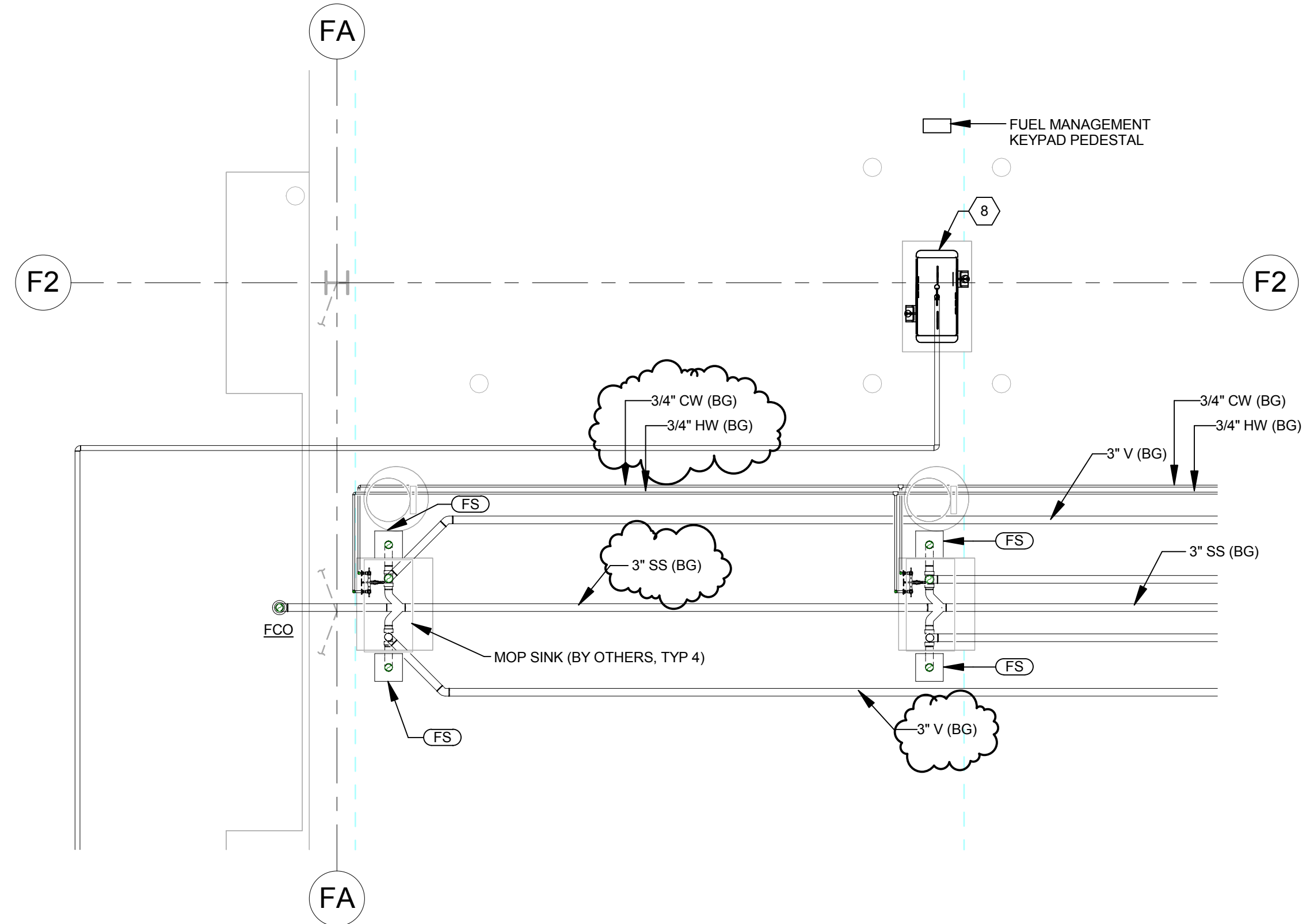
DATE:
07/31/14

BY:
SS

DESCRIPTION:
**ADDED BELOW GRADE
CALLOUT - DRAWING
P2.4**



Daniel Boyd Reiter
PA3.0_2



1 FUELING STATION PLUMBING PLAN
1/4" = 1'-0"

PROJECT NAME
Butte Regional Transit
Operations Center

PROJECT ADDRESS
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CHICO, CA 95928



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2235 Mercury Way, Suite 150
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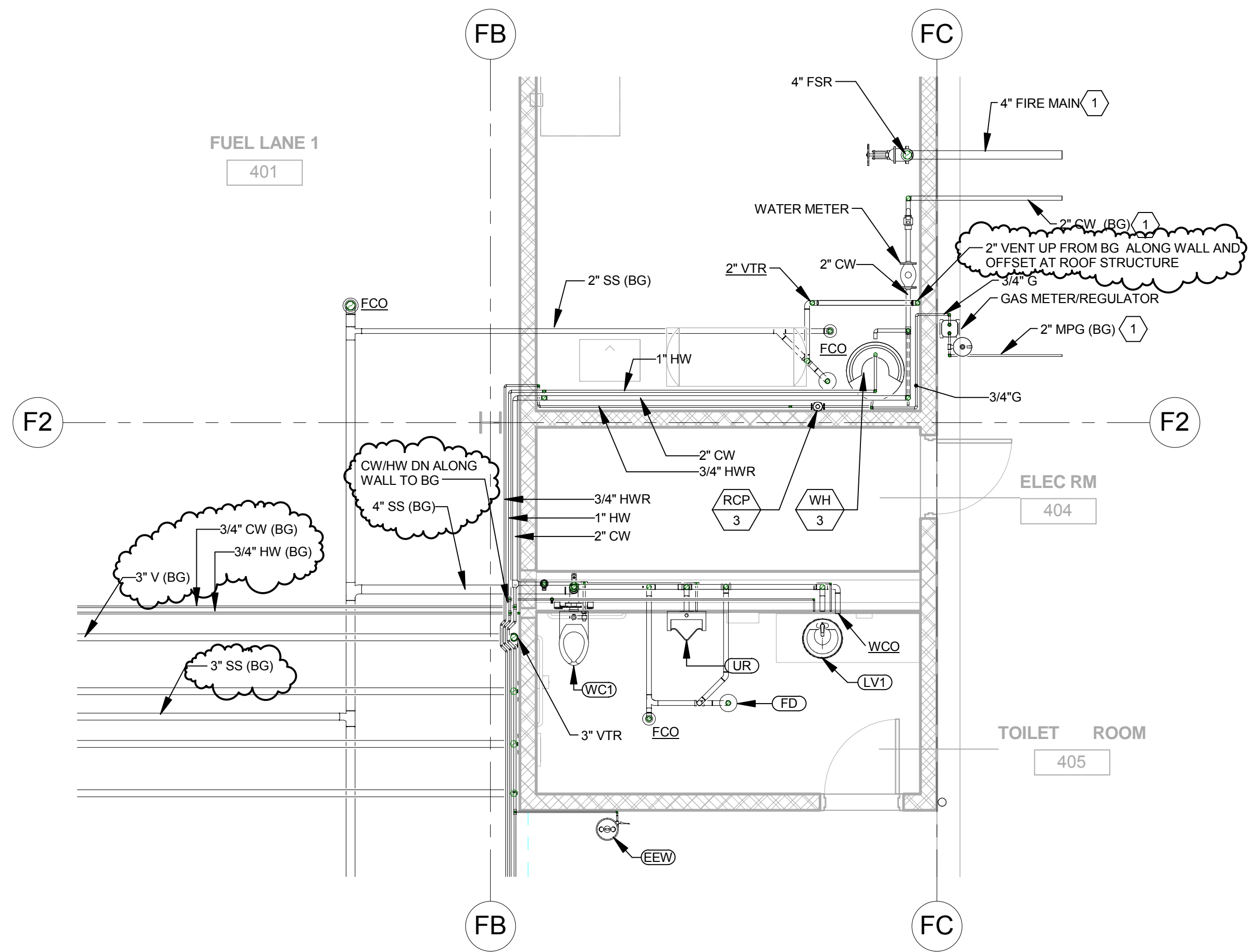
DATE:
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SS

DESCRIPTION:
ADDED BELOW GRADE
CALLOUT - DRAWING
P2.4



Daniel Boyd Reiter
PA4.0_2



1 FUELING STATION PLUMBING PLAN
1/4" = 1'-0"

PROJECT NAME
Butte Regional Transit
Operations Center

PROJECT ADDRESS
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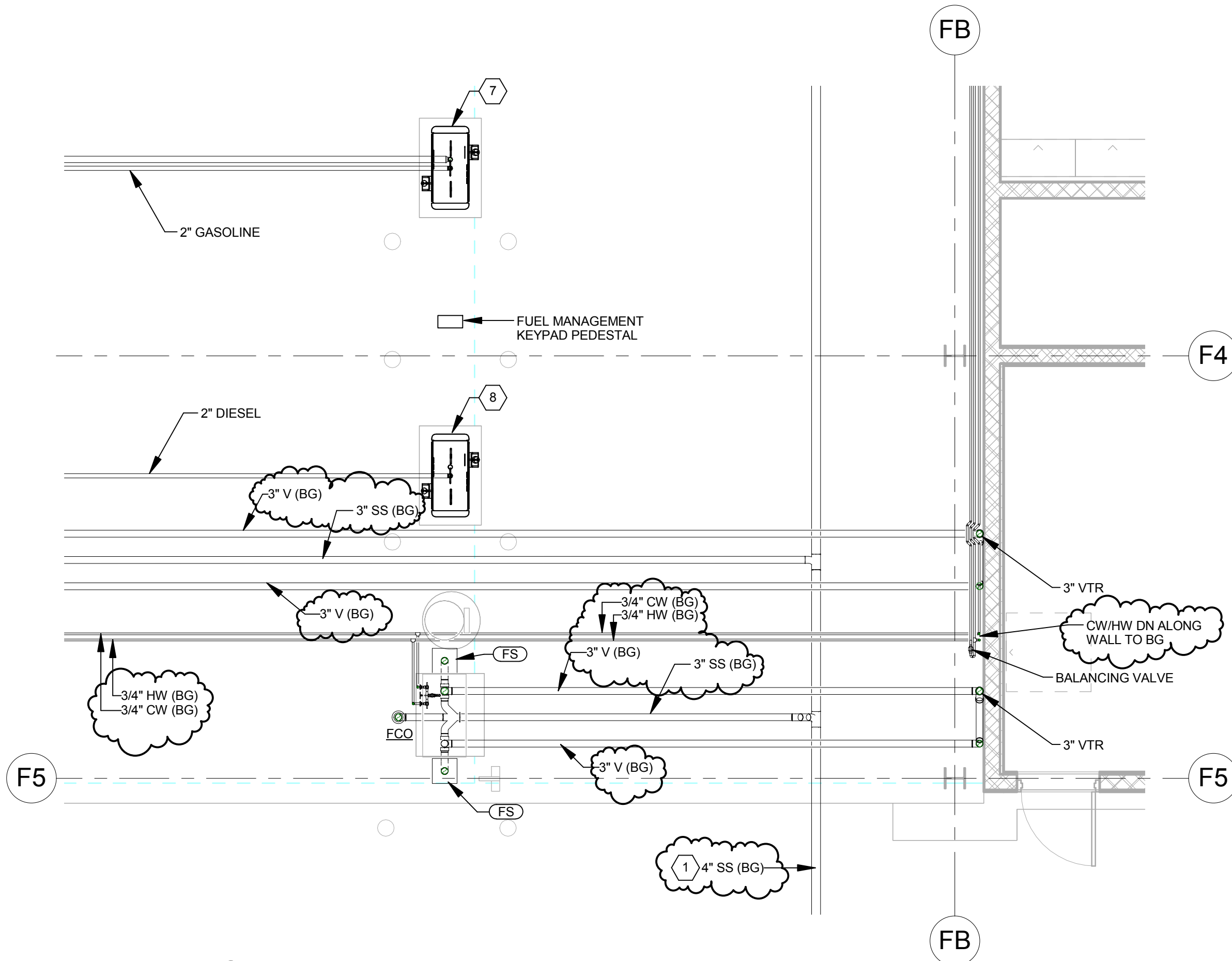
DATE:
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BY:
SS

DESCRIPTION:
ADDED BELOW GRADE
CALLOUT - DRAWING
P2.4



Daniel Boyd Reiter
PA5.0_2



1 FUELING STATION PLUMBING PLAN
1/4" = 1'-0"

LOCAL CONNECTION SCHEDULE									
MARK	DESCRIPTION	MANUFACTURER	MODEL No.	FLOW RATE	WASTE	VENT	CW	HW	NOTES
WC1	WATER CLOSET	AMERICAN STANDARD	2257.576	1.28 GPF	4"	2"	1"	-	1, 6
WC2	WATER CLOSET	AMERICAN STANDARD	3461.576	1.28 GPF	4"	2"	1"	-	1, 7
UR	URINAL	AMERICAN STANDARD	6590.525	0.125 GPF	2"	2"	3/4"	-	6
LV1	LAVATORY	AMERICAN STANDARD	0496.221	0.5 GPM	2"	2"	1/2"	1/2"	2,3
	FAUCET	SLOAN	EXF-250.500.000.CP						
LV2	LAVATORY	AMERICAN STANDARD	0356.421	0.5 GPM	2"	2"	1/2"	1/2"	2,3
	FAUCET	SLOAN	EXF-250.500.000.CP						
SHR	SHOWER VALVE/HEAD	SYMMONS	C-96-300-B30-1.5	1.5 GPM	2"	2"	1/2"	-	
S1	SINK	JUST	SL-2233-A-GR	2.2 GPM	2"	2"	1/2"	1/2"	2,3,7
	FAUCET	CHICAGO	2302-GN8AE3CP						
	DISPENSER FAUCET	KOHLER	K-6665						
S2	SINK	JUST	SL-1921-A-GR	2.2 GPM	2"	2"	1/2"	1/2"	2,3,7
	DISPENSER FAUCET	KOHLER	K-6665						
	FAUCET	CHICAGO	201-AGN2AE3-317CP						
	HOT WATER DISPENSER	ISE	F-HC1100 WITH SST-FLTR						
S3	SINK	JUST	SL-2233-A-GR	2.2 GPM	2"	2"	1/2"	1/2"	2,3
	FAUCET	CHICAGO	201-AGN8AE3-317VPACP						
MS	SINK	ZURN	Z5850-D3	2.2 GPM	2"	2"	1/2"	1/2"	2,3
MS	FAUCET	ZURN	Z643MY-FCT-5H	2.2 GPM	2"	2"	1/2"	1/2"	2,3
SK	SINK	ELKAY	LRAD3722	1.5 GPM	2"	2"	1/2"	1/2"	3
SK	FAUCET	CHICAGO	2302-E35ABCP						
MS	MOP SINK	AMERICAN STANDARD	7745.811	2.25 GPM	3"	2"	1/2"	1/2"	7
	FAUCET	CHICAGO	540-LD897SWXFCP						
HWS	HAND WASH STATION	BRADLEY	SN2003	0.5 GPM	2"	2"	1/2"	1/2"	
SHR	SHOWER VALVE/HEAD	SYMMONS	1662.211	1.5	-	-	1/2"	1/2"	9
DF	DRINKING FOUNTAIN	HAWS	1109BP	0.5	2"	2"	1/2"	1/2"	
WHA	WATER HAMMER ARRESTOR	ZURN	Z-1700	-	-	-	-	-	
FD	FLOOR DRAIN	ZURN	Z-415-B	-	2"	2"	-	-	4, 10
FS	FLOOR SINK	ZURN	Z1900	-	-	-	-	-	8
WS	WATER STATION	ELKAY	EMASM	1.0 GPM	2"	2"	1/2"	-	
IM1	ICE MAKER	SCOTSMAN	C0322						
TD1	TRENCH DRAIN	ZURN	Z880	-	2"	2"	-	-	8
TD2	TRENCH DRAIN	ZURN	Z886	-	2"	-	-	-	8
TD3	TRENCH DRAIN	ZURN	Z806	-	2"	-	-	-	
EWS	EMERGENCY SHOWER	BRADLEY	S19-310TT	20 GPM	-	-	1 1/2"	-	
EEW	EMERGENCY EYEWASH	BRADLEY	S19-210Y	3 GPM	-	-	1/2"	-	
HB1	HOSE BIBB	ZURN	Z1335	2.25 GPM	-	-	3/4"	-	5
TP	TRAP PRIMER	MIFAB	M-500	-	-	-	1/2"	-	8

NOTES:

1. CHURCH 2155CT SEAT.
2. INCLUDE ANGLE STOP & SUPPLY
3. INSULATE WITH TRUBRO LAV-GUARD # 101, WHITE
4. SLOAN VBF-72-A1 TRAP PRIMER, TOILET ROOM LOCATIONS
5. LOOSE KEY
6. SEE ARCHITECTURAL DRAWINGS FOR FIXTURE HEIGHT
7. PROVIDE 5 FOOT HOSE AND MOP HOOK
8. PROVIDE TRAP PRIMER (TP) AS SCHEDULED FOR NON-TOILET ROOM LOCATIONS
9. SHOWER DRAIN SAME AS FD
10. TRAP PRIMER CONNECTION

TLCD ARCHITECTURE
 111 SANTA ROSA AVENUE, #300
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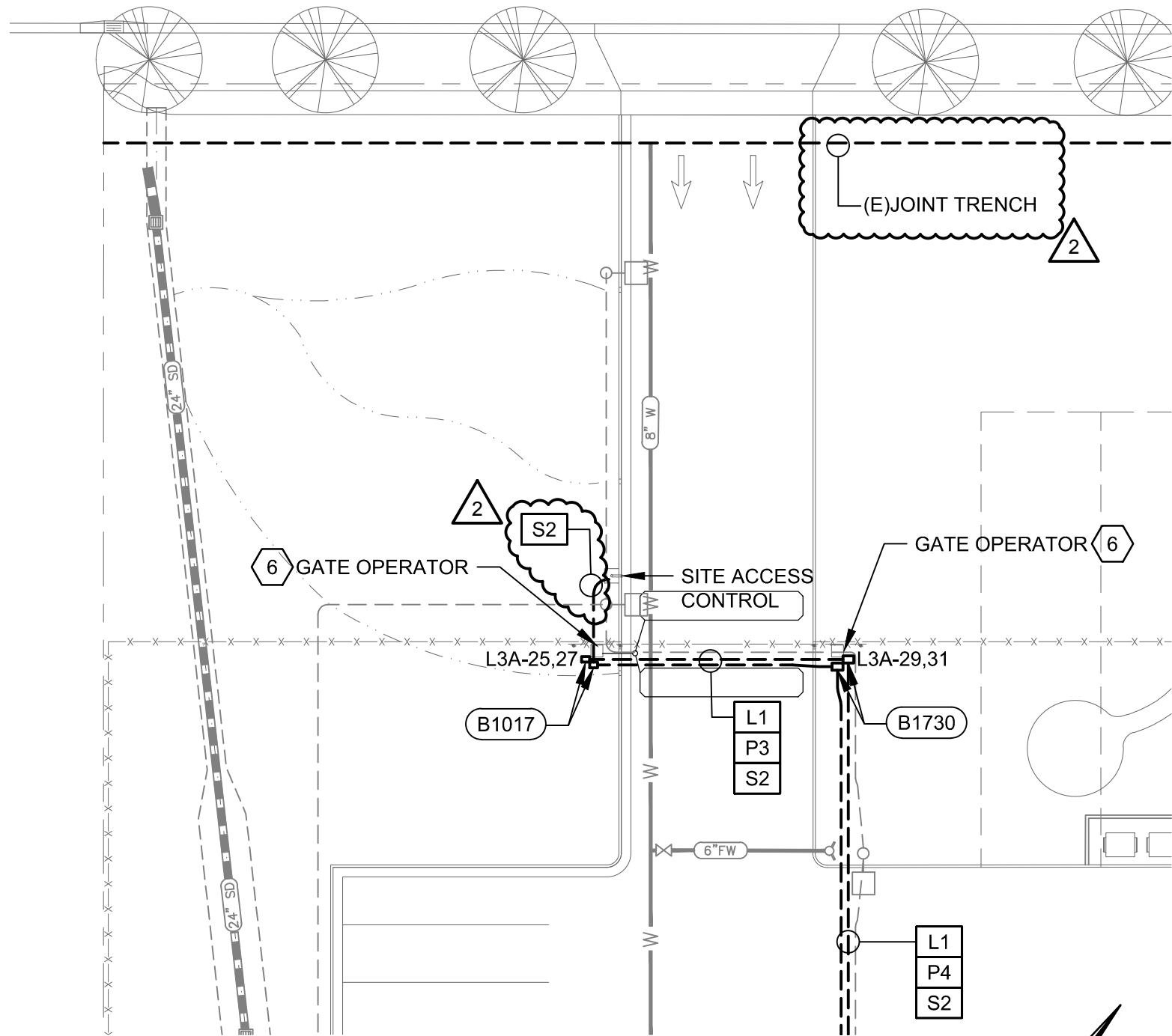
BY:
 SS

DESCRIPTION:
 LOCAL CONNECTION
 SCHEDULE - SHEET P5.1



Daniel Boyd Reiter

PA 6.0_2



KEYNOTES

1. PROVIDE 1" C TO MAINTENANCE BUILDING FIRE ALARM PANEL FOR FIRE SERVICE VALVE MONITORING. REFER TO DETAIL 4/C5.3. SEE FIRE ALARM SYSTEM RISER DIAGRAM FOR CABLE TYPE.
2. PROVIDE 1" C TO LOCAL BUILDING FIRE ALARM PANEL FOR FIRE SERVICE VALVE MONITORING. REFER TO DETAIL 4/C5.3. SEE FIRE ALARM SYSTEM RISER DIAGRAM FOR CABLE TYPE.
3. NOTE DELETED.
4. NOTE DELETED. 2
5. PROVIDE NETWORK CABLE AND CONDUIT AS INDICATED BETWEEN IDF AND LIGHT POLE FOR INSTALLATION OF POLE MOUNT WIRELESS ACCESS POINT BY OTHERS. COORDINATE EXACT LENGTH REQUIRED TO REACH POLE TOP WITH IT CONTRACTOR.
6. GATE OPERATOR, REFER TO DETAIL 1/C5.4 FOR ADDITIONAL DETAILS. PROVIDE CONDUITS AND POWER AS INDICATED FOR A COMPLETE AND OPERATIONAL SYSTEM. ACCESS CONTROL WIRE SHALL BE PROVIDED IN DESIGNATED SECURITY CONDUIT BY OWNER'S SECURITY CONTRACTOR.
7. GATE OPERATOR, REFER TO DETAIL 1/C5.4 FOR ADDITIONAL DETAILS. PROVIDE CONDUITS AND POWER AS INDICATED FOR A COMPLETE AND OPERATIONAL SYSTEM. POWER SHALL BE FED FROM SPARE CIRCUIT IN EXISTING BUILDING. ACCESS CONTROL WIRE SHALL BE PROVIDED IN DESIGNATED SECURITY CONDUIT BY OWNER'S SECURITY CONTRACTOR.
8. SWING GATE, PROVIDE CONDUITS AND POWER AS INDICATED FOR A COMPLETE AND OPERATIONAL SYSTEM. ACCESS CONTROL WIRE SHALL BE PROVIDED IN DESIGNATED SECURITY CONDUIT BY OWNER'S SECURITY CONTRACTOR. 2
9. SWING GATE, PROVIDE CONDUITS AND POWER AS INDICATED FOR A COMPLETE AND OPERATIONAL SYSTEM. POWER SHALL BE FED FROM SPARE CIRCUIT IN EXISTING BUILDING. ACCESS CONTROL WIRE SHALL BE PROVIDED IN DESIGNATED SECURITY CONDUIT BY OWNER'S SECURITY CONTRACTOR.



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DATE:

08/01/14

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DESCRIPTION:

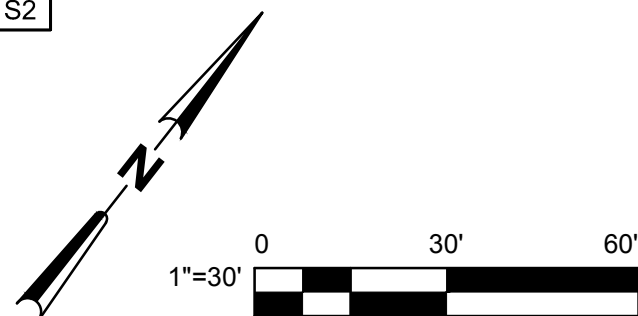
**PG&E AND GATE
ACCESS COORDINATION
DRAWING E1.1**



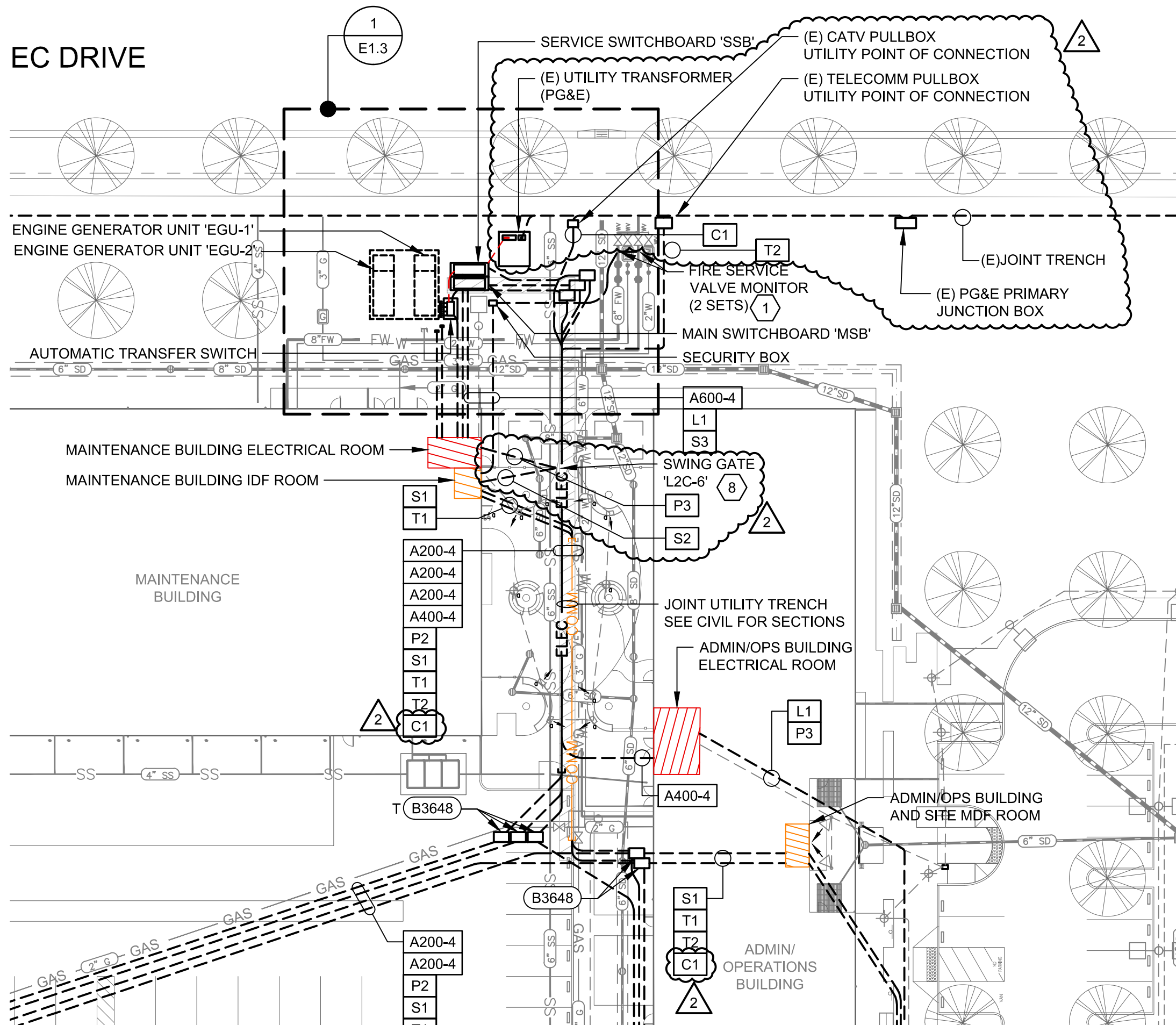
Chris Richards

DRAWING NO:

EA 1.0_2



EC DRIVE



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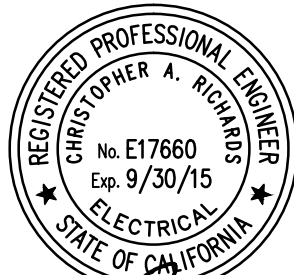
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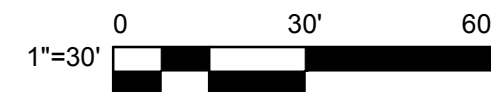
DESCRIPTION:
**PG&E AND GATE
ACCESS COORDINATION
DRAWING E1.1**

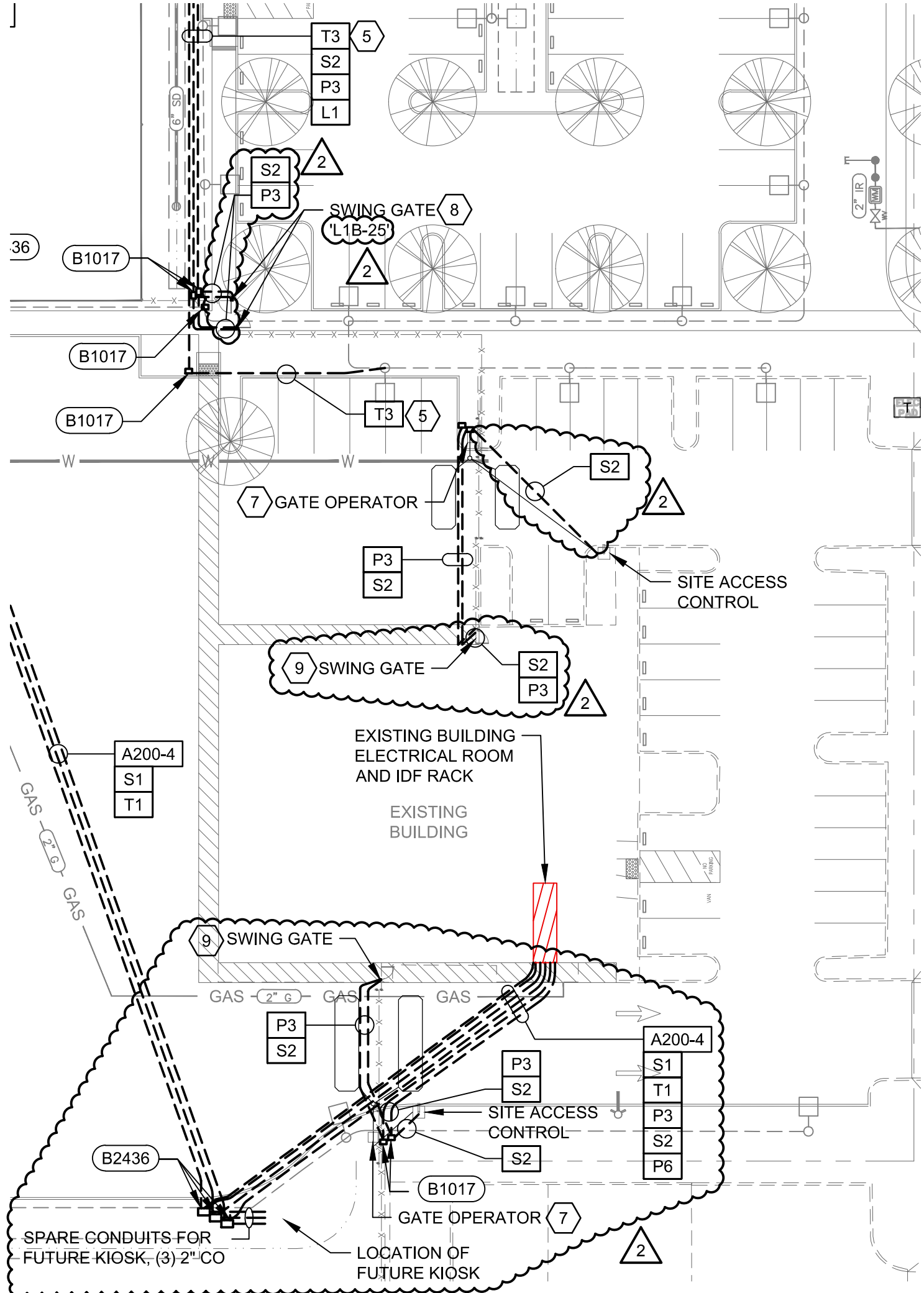


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DRAWING NO:

EA 2.0_2





CONDUIT AND CABLE LEGEND

- P1 (E) PG&E PRIMARY 2
- P2 PV SYSTEM 480V POWER - (2) 4" CO
- P3 GATE POWER CIRCUIT - (1) 1"C - (2) #10 & #10 GND
- P4 GATE POWER CIRCUIT - (1) 1"C - (4) #10 & #10 GND
- P5 (E) PG&E SECONDARY - (4) 5" CO, COORDINATE CONDUCTOR INSTALLATION WITH PG&E 2
- P6 SPARE - (1) 2" CO 2
- L1 SITE LIGHTING - (1) 2"C - (3) #8 & #8 GND TO LOCAL LCP
- S1 FIRE ALARM, SECURITY, AND ACCESS CONTROL BACKBONE - (3) 2"C - (1) 2"C, WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 2"C, FIRE ALARM CABLING PER FIRE ALARM RISER. (1) 2" CO
- S2 ACCESS CONTROL SITE CONDUIT - (2) 1"C - (1) 1"C WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 1" CO.
- S3 FIRE ALARM - (1)1"C - CABLING PER FIRE ALARM RISER.
- T1 DATA SYSTEM BACKBONE - (2) 2"C - (1) 2"C WITH INNERDUCT, 12 STRAND MM FO CABLE, (1) 25-PAIR OSP COPPER CABLE. (1) 2" CO
- T2 AT&T SERVICE CONDUITS - (2) 4" CO
- T3 POLE-MOUNT WAP NETWORK CABLING - (1) 1"C WITH (2) CAT-5e OSP COPPER CABLE.
- Axxx-x FEEDER PER SCHEDULE ON E6.1
- C1 CATV SERVICE CONDUIT - (1) 2" CO 2



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PROJECT ADDRESS
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 CHICO, CA 95928**



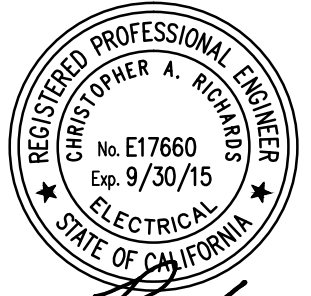
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BY:
SEG

DESCRIPTION:
**PG&E AND GATE
 ACCESS COORDINATION
 DRAWING EI.1**



Chris Richards

DRAWING NO:

EA 3.0_2

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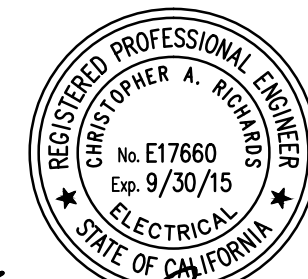
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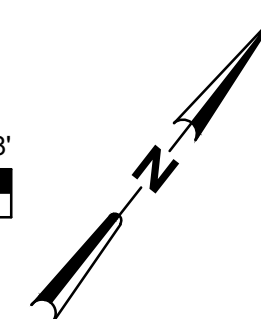
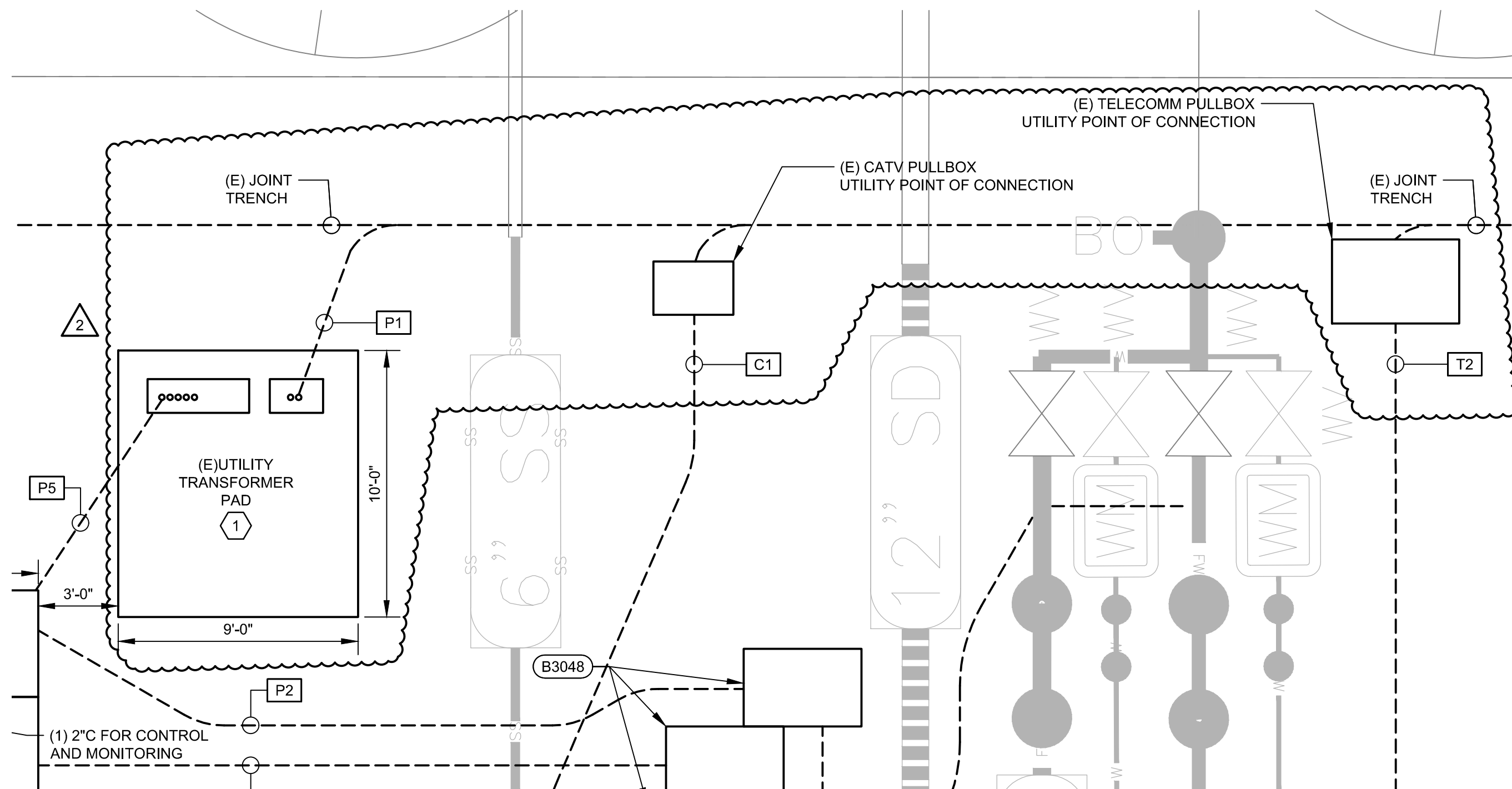
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DRAWING E1.3






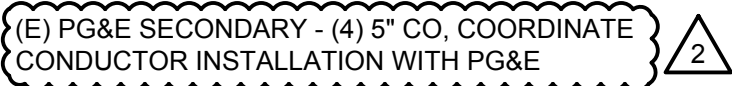





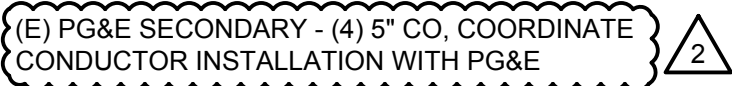





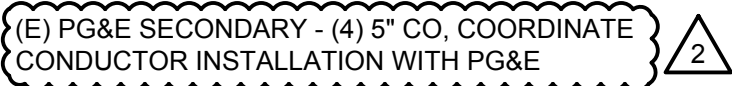





Chris Richards

DRAWING NO:

EA 4.0_2



 KEYNOTES	CONDUIT AND CABLE LEGEND																												
<ol style="list-style-type: none"> 1.  (E) PG&E TRANSFORMER.  2. PROVIDE NEMA 3R SERVICE SWITCHBOARD AND MAIN SWITCHBOARD, INCLUDING BUSSING, BREAKERS, ACCESSORIES, AND MOUNTING HARDWARE. PROVIDE CONCRETE EQUIPMENT PAD PER DETAIL 4/C5.6. SEE ONE-LINE DIAGRAM FOR EQUIPMENT RATINGS. 3. PROVIDE NEMA 3R FREESTANDING ATS, RATINGS AS INDICATED ON THE ONE-LINE DIAGRAM. PROVIDE CONCRETE EQUIPMENT PAD PER DETAIL 4/C5.6. 4. STUB CONDUITS TO THE VICINITY OF THE GENERATOR CONCRETE PAD FOR FUTURE CONNECTION/EXTENSION OR TO BE EXTENDED/CONNECTED AS PART OF BID ALTERNATE #1. 5. FOR BID ALTERNATE #1, EXTEND THE CONDUITS TO THE CONCRETE PAD FOR CONNECTION TO THE GENERATORS. PROVIDE POWER CONDUCTORS AS NOTED ON ONE-LINE DIAGRAM, PROVIDE CONTROL CABLING AS REQUIRED BY THE GENERATOR MANUFACTURER, AND PROVIDE ACCESSORY POWER. PROVIDE CONCRETE EQUIPMENT PAD PER DETAIL 4/C5.6. 	<table border="0"> <tr> <td>P1</td> <td> (E) PG&E PRIMARY </td> </tr> <tr> <td>P2</td> <td>PV SYSTEM 480V POWER - (2) 4" CO</td> </tr> <tr> <td>P3</td> <td>GATE POWER CIRCUIT - (1) 1"C - (2) #10 & #10 GND</td> </tr> <tr> <td>P4</td> <td>GATE POWER CIRCUIT - (1) 1"C - (4) #10 & #10 GND</td> </tr> <tr> <td>P5</td> <td> (E) PG&E SECONDARY - (4) 5" CO, COORDINATE CONDUCTOR INSTALLATION WITH PG&E </td> </tr> <tr> <td>L1</td> <td>SITE LIGHTING - (1) 2"C - (2) #8 & #8 GND TO LOCAL LCP</td> </tr> <tr> <td>S1</td> <td>FIRE ALARM, SECURITY, AND ACCESS CONTROL BACKBONE - (3) 2"C - (1) 2"C, WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 2"C, FIRE ALARM CABLING PER FIRE ALARM RISER. (1) 2" CO</td> </tr> <tr> <td>S2</td> <td>ACCESS CONTROL SITE CONDUIT - (2) 1"C - (1) 1"C WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 1" CO.</td> </tr> <tr> <td>S3</td> <td>FIRE ALARM - (1)1"C - CABLING PER FIRE ALARM RISER.</td> </tr> <tr> <td>T1</td> <td>DATA SYSTEM BACKBONE - (2) 2"C - (1) 2"C WITH INNERDUCT, 12 STRAND MM FO CABLE, (1) 25-PAIR OSP COPPER CABLE. (1) 2" CO</td> </tr> <tr> <td>T2</td> <td>AT&T SERVICE CONDUITS - (2) 4" CO</td> </tr> <tr> <td>T3</td> <td>POLE-MOUNT WAP NETWORK CABLING - (1) 1"C WITH (2) CAT-5e OSP COPPER CABLE.</td> </tr> <tr> <td></td> <td>Axxx-x FEEDER PER SCHEDULE ON E6.1</td> </tr> <tr> <td></td> <td> C1 CATV SERVICE CONDUIT - (1) 2" CO </td> </tr> </table>	P1	 (E) PG&E PRIMARY 	P2	PV SYSTEM 480V POWER - (2) 4" CO	P3	GATE POWER CIRCUIT - (1) 1"C - (2) #10 & #10 GND	P4	GATE POWER CIRCUIT - (1) 1"C - (4) #10 & #10 GND	P5	 (E) PG&E SECONDARY - (4) 5" CO, COORDINATE CONDUCTOR INSTALLATION WITH PG&E 	L1	SITE LIGHTING - (1) 2"C - (2) #8 & #8 GND TO LOCAL LCP	S1	FIRE ALARM, SECURITY, AND ACCESS CONTROL BACKBONE - (3) 2"C - (1) 2"C, WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 2"C, FIRE ALARM CABLING PER FIRE ALARM RISER. (1) 2" CO	S2	ACCESS CONTROL SITE CONDUIT - (2) 1"C - (1) 1"C WIRING PER SECURITY / ACCESS CONTROL VENDOR REQUIREMENTS. (1) 1" CO.	S3	FIRE ALARM - (1)1"C - CABLING PER FIRE ALARM RISER.	T1	DATA SYSTEM BACKBONE - (2) 2"C - (1) 2"C WITH INNERDUCT, 12 STRAND MM FO CABLE, (1) 25-PAIR OSP COPPER CABLE. (1) 2" CO	T2	AT&T SERVICE CONDUITS - (2) 4" CO	T3	POLE-MOUNT WAP NETWORK CABLING - (1) 1"C WITH (2) CAT-5e OSP COPPER CABLE.		Axxx-x FEEDER PER SCHEDULE ON E6.1		 C1 CATV SERVICE CONDUIT - (1) 2" CO 
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PROJECT NAME
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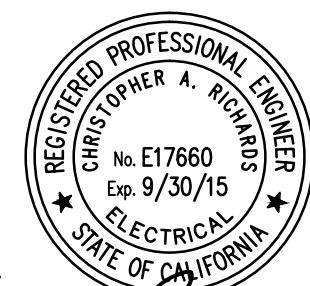
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SEG

DESCRIPTION:
PG&E COORDINATION
DRAWING E1.3



Chris Richards

DRAWING NO:

EA 5.0_2

KEYNOTES

- 9. (E) PG&E TRANSFORMER.
- 10. (E) PG&E PRIMARY SERVICE CONDUIT AND CONDUCTORS.
- 11. (E) SECONDARY CONDUIT. SECONDARY SERVICE CONDUCTORS BY PG&E, COORDINATE INSTALLATION OF CABLES WITH PG&E.



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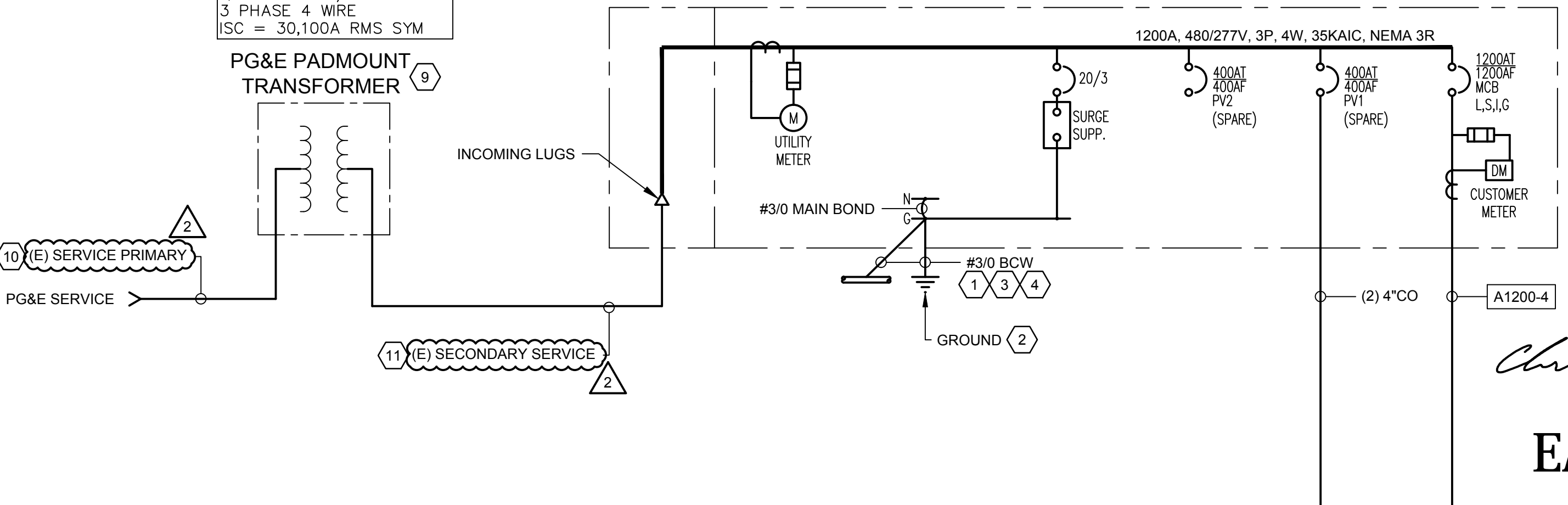


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SERVICE DATA:
 1,200AMP 480/277 VOLTS
 3 PHASE 4 WIRE
 ISC = 30,100A RMS SYM

PG&E PADMOUNT TRANSFORMER

SERVICE SWITCHBOARD 'SSB' ISC (MAX) = 30,100A RMS SYM

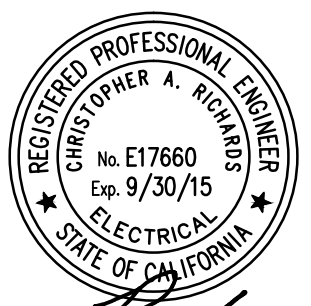


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11054.03

DATE:
08/01/14

BY:
SEG

DESCRIPTION:
**PG&E COORDINATION
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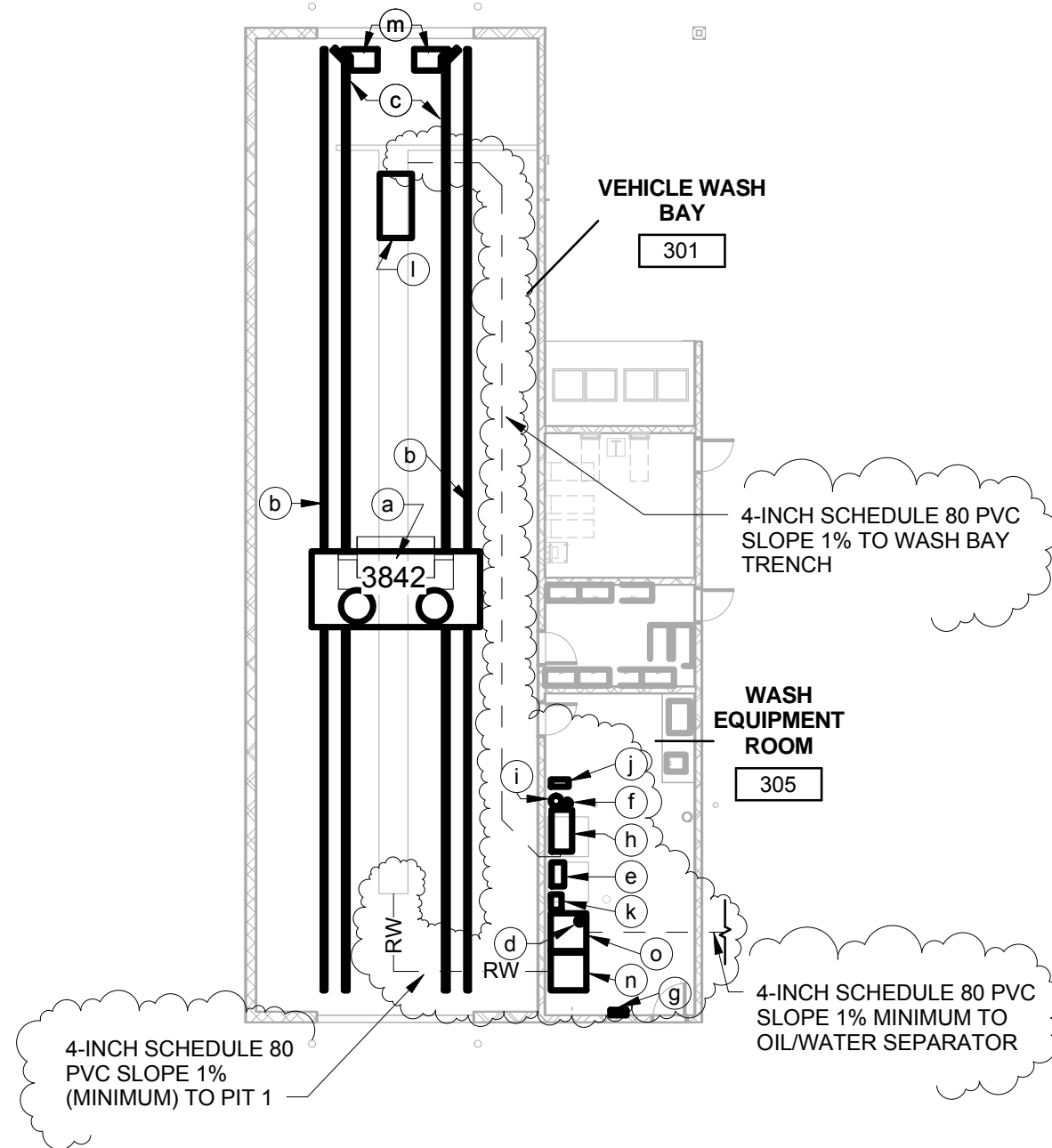
Chris Richards

DRAWING NO:

EA 6.0_2

WASH EQUIPMENT KEYNOTES " # "

- a 3 BRUSH ROLLOVER SYSTEM
- b FLOOR RAIL
- c GUIDE RAILS
- d SUBMERSIBLE PUMP FOR WATER RECYCLING
- e WATER RECYCLING SYSTEM
- f WASH WATER PUMP
- g RECYCLING / PUMP CONTROL PANEL
- h BUFFER TANK
- i HIGH PRESSURE PUMP
- j DETERGENT MIXING / METERING PUMP
- k OZONE GENERATOR
- l UNDERCHASSIS WASH
- m SKID PLATE
- n PIT 1
- o PIT 2



PROJECT NAME
Butte Regional Transit
Operations Center

PROJECT ADDRESS
326 HUSS DRIVE
CHICO, CA 95928

TLCD PROJECT NO:
11054.03

DATE:
08/01/14

BY:
KB

DESCRIPTION:
VEHICLE WASH
EQUIPMENT

ADDENDUM #2 - WASH BUILDING - EQUIPMENT LAYOUT PLAN

1

1/16" = 1'-0"

DRAWING NO:

QA 2.0_2

PROJECT NAME
**Butte Regional Transit
Operations Center**

PROJECT ADDRESS
**326 HUSS DRIVE
CHICO, CA 95928**

TLCD PROJECT NO:
11054.03

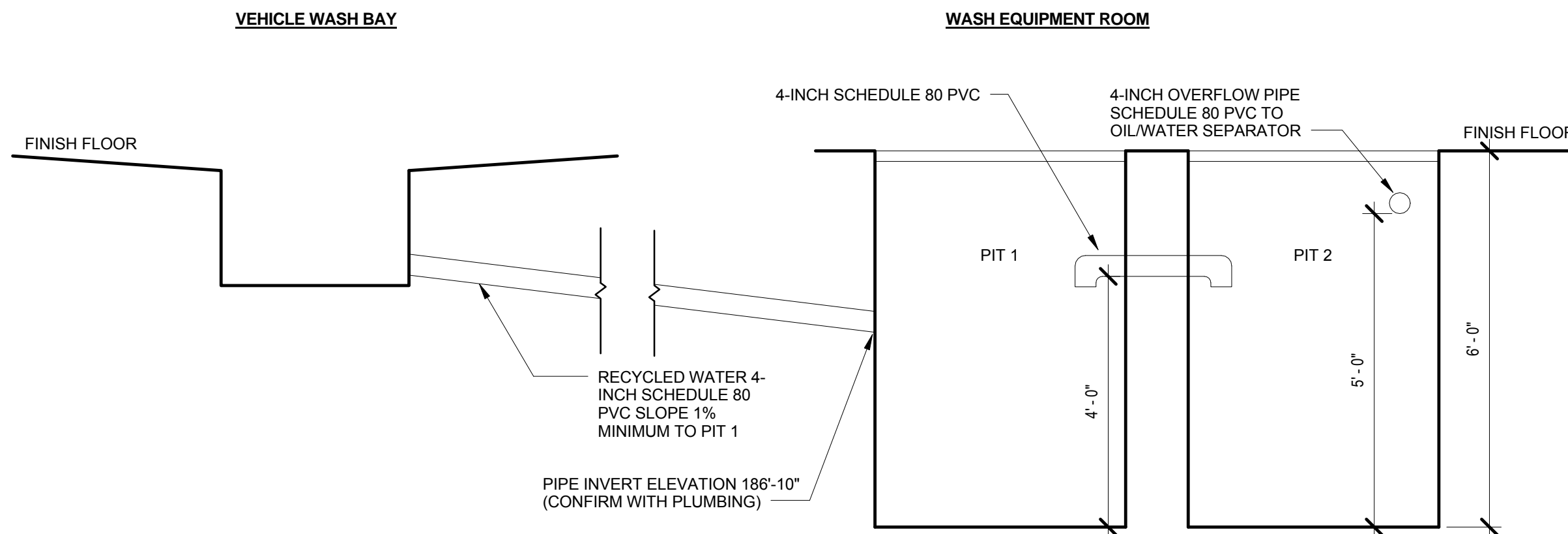
DATE:
08/01/14

BY:
KB

DESCRIPTION:
**TRENCH/PIT FOR
VEHICLE WASH
RECYCLE SYSTEM**

DRAWING NO:

QA 2.1_2



NOTE: PRIOR TO INSTALLING TRENCH, PITS, AND BELOW GRADE PIPING, REVIEW ACCEPTED BUS WASH MANUFACTURER SHOP DRAWINGS

1 TRENCH/PIT FOR VEHICLE WASH RECYCLE SYSTEM

NTS

STORM WATER POLLUTION PREVENTION PLAN

for

BUTTE REGIONAL TRANSIT OPERATIONS CENTER

RISK LEVEL 2

Legally Responsible Person (LRP):

Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100, Chico, 95928
Mr. Andy Newsum
Deputy Director
(530) 879-2468

Approved Signatory:

<QSP Contact Name>
<QSP Title>
<QSP Phone Number>

Prepared for:

Butte County Association of Governments
2580 Sierra Sunrise Terrace, Suite 100, Chico, 95928
Phn (530) 879-2468 Fax (530) 879-2444

Project Address:

Butte Regional Transit Operations Center, 326 Huss Drive, Chico CA, 95928

SWPPP Prepared by:

GHD
2235 Mercury Way, Suite 150, Santa Rosa CA 95407

SWPPP Preparation Date

April, 2014

Estimated Project Dates:

Begin Construction (NTP): October, 2014

Complete Construction: April, 2016

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 - ~~○ Appendix A3 - Post Construction Hydrology & Hydraulics Calculations~~
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- Appendix D - SWPPP Amendment Certifications
- Appendix E - Submitted Changes to PRDs
- ~~• Appendix F - Construction Schedule~~

- Appendix F1 – Precipitation Summary for Planning
- ~~○ Appendix F2 – Construction Schedule~~
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- Appendix K - Training Report Form
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- Attachment 4 - Field Meter Instructions
- Attachment 5 - Supplemental Information

Qualified SWPPP Developer - QSD

Approval and Certification of the Storm Water Pollution Prevention Plan

Project Name: Butte Regional Transit Operations Center

Project Number/ID Application ID# XXXXX

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

QSD Signature

Steve Grupico

Date

XXXXXX

QSD Name

PE, QSD with GHD

QSD Certificate Number

(707) 523-1010

Title and Affiliation

Steve.Grupico@GHD.com

Telephone Number

Email

Legally Responsible Person - LRP

Approval and Certification of the Storm Water Pollution Prevention Plan

Project Name: Butte Regional Transit Operations Center

Project Number/ID Application ID# XXXXX

"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."

Legally Responsible Person

Signature of Legally Responsible Person or Approved Signatory

Date

Name of Legally Responsible Person or Approved Signatory

Telephone Number

Section 1 SWPPP Requirements

1.1 INTRODUCTION

The Butte Regional Transit Operations Center project is the proposed construction of a new transit administration, operations and maintenance facility for the Butte County Association of Governments (BCAG) providing civil, mechanical, plumbing, and electrical / telecommunications engineering services and LEED certification. The project constructs a new administration and operations building, maintenance building, bus wash facility, and fueling station on a 10 acre site which will serve as the B-Line bus services new main facility. The project includes all new wet and dry utility systems, underground gasoline and diesel fuel storage, parking for 95 bus and paratransit vehicles, and 110 parking spaces for visitors and employees. Site designs include a new primary bus entrance and exit driveways with automatic cantilever gates, excavation, grading, lime treatment of soils, and paving and storm water improvements. Storm drainage is managed on-site using bioretention swales that incorporate tire derived aggregate for retention of storm water. All storm water runoff is treated prior to release, meeting LEED Sustainable Sites and California Storm Water General Permit requirements. It is anticipated that the project will achieve LEED Silver certification.

This Storm Water Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit or CGP) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the template provided on the California Storm Water Quality Association Storm Water *Best Management Practice Handbook Portal: Construction* (CASQA, 2010), and also the most current information from the State of California Department of Transportation (Caltrans) statewide storm water program. This SWPPP is designed to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-storm water discharges are identified and either eliminated, controlled, or treated.

Note that the Project is located within the Central Valley Regional Water Quality Control Board (Region 5) jurisdiction.

Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Storm Water Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site and Vicinity Maps;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal);
6. Post-construction water balance calculation; and
7. SWPPP.

Site and Vicinity Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The Contractor shall make working copies of the SWPPP available at the construction site during working hours (as specified) while construction is occurring. It is expected that the contractor will have a master copy of the SWPPP and Water Pollution Control Drawings (WPCDs) appropriate for that contractors work area with all revisions, amendments, and WPCDs.

The SWPPP shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and WPCDs will be left with the field crew and the original SWPPP shall be made available via request by radio or telephone.

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP AMENDMENTS

The SWPPP shall be revised when:

- there is a General Permit violation,
- there is a reduction or increase in total disturbed acreage,
- Design Build documents are finalized, allowing creation of work area specific WPCDs,
- BMPs do not meet the objectives of reducing or eliminating pollutants in storm water discharges.

The SWPPP shall be amended when:

- there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- there is a change in the project duration that changes the project's risk level; or
- deemed necessary by the QSD. The QSD has determined that the changes listed in Table 1.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.
- Subsequent phases are defined and scheduled for construction.

The following items shall be included in each amendment:

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

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

Table 1.1 List of Changes to be Field Determined

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

1.5 RETENTION OF RECORDS

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

- NOI
- SWPPP

- Inspection Log
- Weekly BMP Inspection Checklist(s)
- Pre-Rain Event Inspection Checklist(s)
- 24-hour Rain Event Inspection Checklist(s)
- Post Rain Event BMP Inspection Checklist(s)
- NAL Exceedance Report(s)
- Quarterly Non-Storm Water Inspection Report(s)
- Annual Report(s)

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

1.6 REQUIRED NON-COMPLIANCE REPORTING

If a discharge violation occurs the QSP shall immediately notify the QSD and LRP, and the LRP or QSD shall file a violation report electronically to the State Water Board within 10 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge, or written notice of non-compliance from the State or Regional Water Board. Discharges and corrective actions will be documented on the NAL Exceedance Site Evaluation Report Form in Attachment 3 “Example Forms.”

The report shall contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.

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

Reporting requirements for Numeric Action Levels (NALs) exceedances are further discussed in Section 7.7.2.7 of this SWPPP.

1.7 ANNUAL REPORT

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

1.8 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of

coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

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

1.9 NOTICE OF TERMINATION

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

Section 2 Project Information

2.1 PROJECT AND SITE DESCRIPTION

2.1.1 Site Description

The Butte Regional Transit Operations Center project constructs a new administration and operations building, maintenance building, bus wash facility, and fueling station on a 10 acre site which will serve as the B-Line bus services new main facility. The project includes all new wet and dry utility systems, underground gasoline and diesel fuel storage, parking for 95 bus and paratransit vehicles, and 110 parking spaces for visitors and employees. Site designs include a new primary bus entrance and exit driveways with automatic cantilever gates, excavation, grading, lime treatment of soils, and paving and storm water improvements. The project is located at 326 Huss Drive in Chico, California.

2.1.2 Existing Conditions

The existing site is approximately 10.00 acres, slopes approximately 0.5 to 1.0% percent from the northeast to southwest through the project site and consists of open grasslands with an existing structure and associated improvements.

2.1.3 Existing Drainage

The project site is located within the Sacramento River watershed. Runoff from the project site is conveyed to Comanche Creek via off site storm drain system. Comanche Creek is identified on the State of California Clean Water Act Section 303(d) list. Comanche Creek is impaired with diuron. No special permits required.

The project has the potential to discharge to the following watercourses that are listed on the Clean Water Act 303(d) List of Water Quality Limited Segments (2006 version) for sediment related impairment, and/or are designated as having beneficial uses of COLD, SPAWNING, and MIGRATORY, including:

- Comanche Creek;
- Sacramento River;

2.1.4 Construction Activities and Associated BMPs Description

Project grading will occur throughout the entire site. Grading will include both cut and fill activities. A currently unknown quantity of fill material will be imported during grading activities. Graded materials are expected to be balanced onsite. Stockpiles, if any, will typically be located at a construction or staging yard. Refer to WPCDs for locations.

The BMPs included in this SWPPP may be utilized at any time by the Contractor or QSP to prevent or reduce potential storm water pollution. Typical BMP recommendations appropriate for each construction activity class are listed below. All Non-Storm Water and all Waste Management BMPs apply at all times as basic good housekeeping measures during construction activities.

This project includes the construction of several structures, underground utilities, asphalt paving, concrete flat work, and associated landscaping.

2.1.5 Developed Condition Description

Post construction runoff will be directed by surface flow towards landscaped areas, vegetated swales and drop inlets.

Table 2.1 Construction Site Estimates

Construction site area	Approximately 10	acres
Percent impervious before construction	< 26%	2.6
Runoff coefficient before construction	Average C 0.49	
Percent impervious after construction	< 53%	5.3
Runoff coefficient after construction	Average C 0.64	

2.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account as best possible while preparing this SWPPP

- Regional Water Board requirements;
- Contract Documents;

2.3 STORM WATER RUN-ON FROM OFFSITE AREAS

Run-on to the site is generated by point source discharges from up gradient developed land uses, watercourses that run through the site; and up gradient non-point source discharges (dry weather and storm water runoff). The General Permit requires that temporary BMPs be implemented to direct offsite run-on away from disturbed areas through the use of runoff controls. The Contractor may use any of the BMPs included in Table 3.1 to temporarily re-direct site run-on. Run-on to the project site occurs at the north end adjacent to Huss Drive. Run-on is conveyed across the project boundary by overland flows.

2.4 CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 2. The risk level was determined through the use of the site specific method summarized in Appendix 1 of the CGP, which includes calculating the sites sediment and receiving water risk during periods of soil exposure. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix C.

This project is located within jurisdictions the Central Valley Regional Quality Water Control Board.

Table 2.2 and Table 2.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 2.2 Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value
R	46	NPDES Rainfall Erosivity Factor Calculator
K	0.59	NRCS Web Soil Survey & SWB soils K factor data set
LS	0.12	Maximum allowable LS per RUSLE with fixed R and K factors
Total Predicted Sediment Loss (tons/acre)		3.26
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		<input checked="" type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High

Table 2.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant ⁽¹⁾	TMDL for Sediment Related Pollutant ⁽¹⁾	Beneficial Uses of COLD, SPAWN, and MIGRATORY ⁽¹⁾
Comanche Creek	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Overall Receiving Water Risk			<input type="checkbox"/> Low <input checked="" type="checkbox"/> High
(1) If yes is selected for any option the Receiving Water Risk is High			

As summarized above, the project has a medium sediment risk and a high receiving water risk. Per the combined risk level matrix in Appendix 1, the project has a calculated risk level of 2.

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

Table 2.4 Numeric Action Levels (NAL)

Parameter	Unit	Numeric Action Level: Daily Average of Samples
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	NTU	250 NTU

2.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on the assumption that construction would take place between October, 2014 and April, 2016

Modification or extension of the schedule (start and end dates) may affect risk determination and permit requirements. The LRP shall contact the QSD if the schedule changes during

construction to address potential impact to the SWPPP. The Contractors schedule for planned work shall be created, and copies shall be kept in Appendix F.

2.6 POTENTIAL CONSTRUCTION ACTIVITY POLLUTANT SOURCES

Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators provide a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to storm water runoff.

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

For sampling requirements of non-visible pollutants associated with construction activity refer to Section 7.7.1. For additional data about potential onsite pollutants, refer to the Material Safety Data Sheets (MSDS), which are retained onsite at the construction trailer(s).

2.7 IDENTIFICATION OF NON-STORM WATER DISCHARGES

Non-storm water discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-storm water discharges that do not cause erosion or carry other pollutants.

Non-storm water discharges into storm drainage systems or watercourses, that are not authorized under the General Permit and listed in the SWPPP, or otherwise authorized under a separate NPDES permit, are prohibited.

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

Non-storm water discharges that are authorized from this project site include the following:

- None

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

Activities at this site that may result in unauthorized non-storm water discharges are listed in Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators.

2.8 REQUIRED SITE MAP INFORMATION.

The Site and Vicinity Map(s) showing the project location, surface water locations, geographic features, construction site perimeter, general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 2.6 identifies Map or Sheet Nos. where required elements are illustrated.

Table 2.5 Required Map Information

Included on Map/Plan Sheet No. ⁽¹⁾	Required Element
Vicinity Map(S)	The project's surrounding area (vicinity)
Site Map(s)	Site layout

Table 2.5 Required Map Information

Included on Map/Plan Sheet No. ⁽¹⁾	Required Element
WPCDs & Construction Plans	Construction site boundaries
WPCDs	Drainage areas
WPCDs & Construction Plans	Discharge locations
WPCDs	Sampling locations
WPCDs & Construction Plans	Areas of soil disturbance (temporary or permanent)
WPCDs & Construction Plans	Active areas of soil disturbance (cut or fill)
WPCDs	Locations of runoff BMPs
WPCDs	Locations of erosion control BMPs
WPCDs	Locations of sediment control BMPs
WPCDs & Construction Plans	ATS location (if applicable)
WPCDs & Construction Plans & Biological Assessment	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
WPCDs & Construction Plans	Locations of all post construction BMPs - September 2012
WPCDs	Waste storage areas
WPCDs	Vehicle storage areas
WPCDs	Material storage areas
WPCDs & Construction Plans	Entrance and Exits
WPCDs	Fueling Locations

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

Section 3 Best Management Practices

3.1 SCHEDULE FOR BMP IMPLEMENTATION

Table 3.1 BMP Implementation Schedule

	BMP	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of Project
	EC-4, Hydroseed	As grading is completed	Until vegetation is established
	SE-1, Silt Fence	Start of Construction	Entirety of Project
	SE-4, Check Dams	During construction for control of concentrated flow	Entirety of Project, not likely to be used
Sediment Control	SE-5, Fiber Rolls	Start of Construction	Entirety of Project
	SE-7, Street Sweeping	Start of Construction	Entirety of Project
	SE-10, Temporary Drain Inlet Protection	Start of Construction near drain inlet	Until Construction activities near drain inlet are complete and site is stabilized
Tracking Control	TC-1, Temporary Construction Entrance	Start of Construction	Entirety of Project
	TC-3, Entrance Outlet Wash	If required to control significant tracking issues	Until there are no significant tracking issues
Wind Erosion	WE-1, Wind Erosion Control	Start of Construction	Entirety of Project

3.2 EROSION AND SEDIMENT CONTROL

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

If there is a conflict between documents: specific details in the Site Map or WPCDs prevail over guidance in the BMP Fact Sheets. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

3.2.1 Erosion Control

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

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

- (2) Preserve existing vegetation where required and when feasible.
- (3) The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively.
- (4) Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
- (5) Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
- (6) Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.
- (7) Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

Table 3.2 indicates the temporary erosion control BMPs that shall be implemented to control erosion. Fact Sheets for temporary erosion control BMPs are provided in Appendix H.

Table 3.2 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓	✓		
EC-4	Hydroseed	✓ ⁽²⁾	✓		
EC-9	Earth Dike and Drainage Swales	✓ ⁽³⁾	✓		
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					If used, state reason:
⁽¹⁾ Applicability to a specific project shall be determined by the QSD. ⁽²⁾ The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements. ⁽³⁾ Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting					

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix H.

Scheduling

Construction activities will be scheduled to reduce the amount of disturbance to the soil at any one time, as well as to reduce the amount of damage that could occur to the soil that is exposed. The first step in the scheduling process is to schedule the work activities to minimize the possibility of having exposed soil during the rainy periods. In addition, the work will be scheduled to disturb minimal amounts of the site at one time, and to protect any disturbed areas as soon as possible in the construction process.

The contractors detailed construction schedule for the period October 2014 to April 2016 is included in Appendix F Construction Schedule.

Appendix F Construction Schedule includes a summary table of precipitation for the last 5 years (2007 to 2011), with average, minimum, & maximum counts for Qualifying & Non-Qualifying precipitation rates broken out by month. Contractor is encouraged to review the information to assist with planning and preparation for precipitation events.

Preservation of Existing Vegetation

Existing vegetation shall be preserved, where applicable since it allows flows to infiltrate, stabilizes soil, and acts as a velocity dissipater. It is recommended to strip and stockpile topsoil, including vegetation, along the edge of the grading limits, then redistribute over disturbed areas to aid in rapid establishment of vegetation. As best possible keep the stockpiled soils slightly damp to damp until redistributed.

Crimp, or track walk, material when redistributed over exposed soils and before applying hydraulic mulch or hydroseeding. Tracking shall be perpendicular to slope for slopes over 3%.

Hydroseeding

Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control. Otherwise, hydroseeding must be used in conjunction with a soil binder or mulching. Hydroseeding mixtures shall be approved by the QSD.

Exposed surface shall be crimped, or track walked, before application. Tracking shall be perpendicular to slope for slopes over 3%.

Earth Dike and Drainage Swales

Earth dikes/drainage swales and lined ditches shall be used to convey surface runoff down sloping land, intercept and divert runoff to avoid sheet flow over sloped surfaces, divert and direct runoff towards a stabilized watercourse, drainage pipe or channel, re-route storm water run-on around the active construction, or intercept runoff from paved surfaces.

Wind Erosion Control

Wind erosion control and soil/aggregate/debris stockpile management must be incorporated if loose debris is to be left exposed. Wind erosion or dust control consists of covering the source with a wind resistant covering, providing a berm or perimeter BMP, or applying water or other

dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities.

Contractor shall limit the use of plastic materials when more sustainable and environmentally friendly alternatives are available. Plastic sheeting used to cover stockpiles or concrete work shall be non photo-degradable and shall be disposed of properly.

This project should employ covering stockpiles of debris as an alternative to applying water or other dust palliatives; however stockpiles may be watered to control the effects of wind erosion if it is the most expedient method. Watering activities shall not create runoff.

Note that if rain is expected the Contractor shall provide stockpile perimeter controls to reduce storm water runoff.

3.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

Sufficient quantities of temporary sediment control materials shall be maintained on-site throughout the duration of the project, allowing for implementation of temporary sediment controls in the event of rain and for rapid response due to failures or emergencies.

Table 3.3 indicates the sediment control BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H. These temporary sediment control BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H.

Table 3.3 Temporary Sediment Control BMPs

CASQ A Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓ ^{(2) (3)}	✓		
SE-4	Check Dams		✓		
SE-5	Fiber Rolls	✓ ⁽²⁾⁽³⁾	✓		
SE-7	Street Sweeping	✓	✓		
SE-10	Storm Drain Inlet Protection	✓ RL2&3	✓		
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-3	Entrance Outlet Tire Wash		✓		Include as option for severe tracking
Alternate BMPs Used:					If used, state reason:
⁽¹⁾ Applicability to a specific project shall be determined by the QSD ⁽²⁾ The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements ⁽³⁾ Risk Level 2 & 3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope					

Silt Fence

Silt fences shall be placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around temporary stockpiles, along streams and channels, and along the perimeter of the project.

Silt fence shall be placed to protect existing wetland as required by project environmental conditions which are included in Section 3.4 Environmental BMPs List and the environmental documentation.

Additional filtration and flow control may be necessary at ends of silt fence if the fencing creates concentrated flow at the ends. Use short lengths of Fiber Roll, or similar, at ends to filter and diffuse concentrated flows.

Note that high visibility orange silt fence is available and serves dual purposes as safety/warning fence and storm water filtration and sediment retention.

Check Dams

Gravel or sand bag barriers maybe used to control runoff velocity within concentrated flow paths at the following intervals:

Flowline Slope	Intervals Between Blocking
Less than 2%	See WPCDs
2% to 4%	100 feet
4% to 10%	50 feet
Greater than 10%	25 feet

Bags shall be placed along the perimeter (low-point) of construction activity, particularly where soil is excavated, in areas of grading, and in areas of demolition to prevent runoff of sediment. At a minimum, adequate stockpiles of gravel bags shall be stockpiled in close proximity during dry weather.

Fiber Rolls

Fiber rolls shall be the primary BMP for containing sediment along the project and at the staging area. The entire perimeter of the construction staging areas shall be lined with fiber rolls. Additionally, areas along the project perimeter where the occurrence of runoff is evident will be lined with fiber rolls. Adequate stockpiles of fiber rolls shall be stockpiled in close proximity to areas of potential exposure, ready to deploy at any time. Unless fiber roll material is completely biodegradable, fiber rolls shall be removed when construction activities are complete.

Fiber rolls may be used as perimeter control around stockpiles, or in any situation where immediate sediment control is necessary. Fiber rolls may be held in place with sandbags or gravel bags for temporary installation, or for installation on hard surfaces.

Fiber rolls shall be placed to protect existing waterways at culvert locations near active construction. As necessary install fiber rolls along top of bank to protect waterway from storm water or other construction related potential pollution sources.

On bare cut slopes install fiber rolls at the following intervals perpendicular to the slope:

Slope (Percent)	Sheet flow length not to exceed
0% to 25% (4:1)	20 feet
25% to 50% (4:1 to 2:1)	15 feet
Over 50% (2:1)	10 feet

Street Sweeping

Street sweeping and/or vacuuming shall include the use of self-propelled and walk-behind equipment to remove sediment from the project site, roadways, and sidewalks. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters. Particular attention shall be given to areas in and around drain inlets and at the construction entrance. Water sweepers shall not be used.

Vacuuming or sweeping shall be completed daily when necessary and prior to any precipitation event.

Storm Drain Inlet Protection

All storm drain inlets within 50 feet of construction activity, or directly receiving storm water runoff from the active construction area, shall be protected at all times during construction activities to prevent or reduce runoff of sediment into storm drain systems. Storm drain inlet protection devices shall be inspected and cleaned as necessary to maintain proper function.

Stabilized Construction Entrance and Exit

Any ingress/egress from a paved surface to a non-paved surface that is subject to tracking of sediment shall have a stabilized entrance/exit tracking control device. This may include the installation of a corrugated metal “shaker” plate type system, a “grizzly” type bar system, or placement of geotextile and aggregate. Due to the nature of this project, Contractor may fabricate “cattle guard” style tracking devices using recycled rail and timber material.

If a stabilized exit does not prevent tracking onto paved and public roadways a tire wash system shall be installed and utilized. Contractor shall provide installations details to QSD for review and approval before installation.

Entrance and/or Exit Tire Wash

Tire washes shall be used where a stabilized construction entrance or exit is not preventing tracking onto public roads and becomes a recurrent issue. Tire washes are typically a system that requires a water source and a percolation pit for disposal of the wash water. Contractor shall provide tire wash system information to QSD for approval prior to use.

3.3 NON-STORM WATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

3.3.1 Non-Storm Water Controls

Non-storm water discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-storm water discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-

storm water BMPs is based on the list of construction activities with a potential for non-storm water discharges identified in Appendix G.

Table 3.4 indicates the Non Storm water BMPs that shall be implemented to control non storm water discharges on the construction site. Fact Sheets for temporary non-storm water control BMPs are provided in Appendix H. Non-storm water BMPs shall be implemented in conformance with the following guidelines and in accordance with the BMP Fact Sheets provided in Appendix H.

Table 3.4 Temporary Non-Storm Water BMPs

CASQ A Fact Sheet	BMP Name	Meets a Minimum Requirement ⁽¹⁾	BMP Used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-3	Paving and Grinding Operation		✓		
NS-6	Illicit Connection- Illegal Discharge Connection	✓	✓		
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-12	Concrete Curing		✓		
NS-13	Concrete Finishing		✓		
Alternate BMPs Used:					If used, state reason:
Vehicle Parking & Storage Onsite					Included as supplemental information in NS-10
⁽¹⁾ Applicability to a specific project shall be determined by the QSD					

Water Conservation Practices

Water application rates will be minimized as necessary to prevent runoff and ponding. Water equipment leaks will be repaired immediately. The water truck filling area will be stabilized and shall not allow runoff.

Paving and Grinding Operation

Contractor shall provide BMP's when sawcutting and grinding to prevent slurry run off and to maintain any debris or rubble that these operations may create. Vacuums may be used to control slurry created from saw cutting, sealing, paving, and grinding. Inlets outside of the AC paving area will be protected with the type of DI protection as called out on the WPCDs. Following paving operations, the area will be swept, inlet protection devices will be removed, and the inlets will be inspected for paving materials and cleaned as necessary.

Illicit Connection- Illegal Discharge Connection

The contractor will implement the Illicit Connection/Illegal Discharge Detection Reporting BMP throughout the duration of the project.

Vehicle and Equipment Cleaning

Vehicle and equipment cleaning should be conducted off-site, but if it must occur onsite, it shall only be conducted within the designated staging area or construction yard with temporary secondary containment. Encourage the use of phosphate-free, biodegradable soaps.

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 onsite unless resulting wastes are fully contained and disposed of. Resulting wastes shall not be discharged or buried, and must be captured and recycled or disposed of accordingly.

Cleaning activities shall occur at least 50 ft away from any drainage conveyance or drainage inlet.

Vehicle and Equipment Fueling

Use off-site controlled fueling stations as often as possible. If onsite fueling is necessary, follow these general recommendations:

- Place all equipment or vehicles which are to be fueled in a designated area with the appropriate BMPs installed,
- Never top off vehicles,
- Avoid fueling during rain or provide cover,
- Refuel at least 50 ft away from any drainage conveyance or drainage inlet;
- Place plastic lining beneath vehicle equipment and berm edges.

Absorbent spill cleanup materials and spill kits shall be available in fueling areas and on fueling trucks, and should be disposed of properly after use. Spills or leaks shall be cleaned immediately. Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the absorbent materials promptly and dispose of properly.

Per the D/B Contractor there will be no on-site fuel storage tanks. All fuelers, mechanics, and repairmen shall be supplied with, and trained in the use of, emergency spill kits.

Vehicle and Equipment Parking or Storage at Work Area

If construction equipment is stored or parked at a sensitive work area, or if there is any possibility of leakage from the construction equipment while stored or parked, the Contractor shall provide a containment system similar to NS-10 Vehicle and Equipment Maintenance. At a minimum provide drip pans under all portions of equipment that may leak or drip.

Concrete Curing and Finishing

Protect drain inlets prior to the application of curing compounds. Excess cure water and water from high pressure blasting shall be collected and disposed of, and shall not be allowed to runoff to stormdrain inlets or watercourses. Use wet blankets wherever possible to eliminate excess cure water.

3.3.2 Materials Management and Waste Management

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

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into storm water discharges.

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

- Direct contact with precipitation;
- Contact with storm water run-on and runoff;
- Wind dispersion of loose materials;
- Direct discharge to the storm drain system through spills or dumping;

Extended contact with specific materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into storm water.

A list of construction activities and associated potential pollutants is provided in Appendix G: Construction Activities, Materials Used, Associated Pollutants and Indicators. Table 3.5 indicates the BMPs that shall be implemented to handle materials and control waste materials associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H.

Table 3.5 Temporary Materials Management BMPs

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

Material Delivery and Storage (Outdoor Storage of Raw Materials)

This BMP is intended to prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the storm water system. Minimize the storage of hazardous materials onsite, store materials in designated area(s), use watertight containers with appropriate secondary containment, conduct regular inspections, and incorporate this training in scheduled safety meetings.

Material Use

Prevent or reduce the discharge of pollutants to the storm drain system from material use by using alternative products, minimizing hazardous material use onsite, and training employees/subcontractors. This BMP is suitable when some potentially hazardous materials are present that may be detrimental if released to the environment. These include detergents, plaster, petroleum products, asphalt and other concrete components, concrete compounds, acids, paints, lime, glues, adhesives, solvents, curing compounds, and other materials.

Outdoor Storage of Raw Materials (Stockpile Management)

Stockpile management procedures are designed to reduce or eliminate air and storm water pollution from stockpiles of soil and other construction materials such as paving materials, portland cement (PCC) rubble, asphalt concrete (AC), AC aggregate, asphalt minder, pressure treated wood, etc.

Any exposed soils, materials, waste, or debris shall be stockpiled in a secure area, covered and/or bermed when not in use. Large stockpiles should be placed within secondary containment, such as providing a perimeter of sandbags, fiber rolls, or silt fence. Stockpiles shall have side slopes no steeper than 2:1. Areas of stockpiles shall be identified by the Contractor and/or QSP on the WPCDs as best possible. New or relocated stockpile locations necessary to respond to changing project conditions shall be added to the WPCDs if used for longer than one (1) work week.

In the event that trenches cannot be backfilled at the end of a work day the contractor shall provide safety measures for open excavations. In the event that trenches cannot be backfilled prior to a rain event the contractor shall prevent precipitation and storm water from entering the trenches.

Spill Prevention and Control

Spill prevention and control is required for projects that may produce an unforeseen spill of a chemical or hazardous substance. The purpose of this plan is to 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 Contractors and sub-contractors.

Spill control procedures are implemented any time chemicals or hazardous substances are stored on the project site, which may include the following:

- Dust palliatives,
- Fuels,
- Lubricants,
- Other petroleum distillates.

Please be advised that practices presented in this section are general. Contractor shall identify appropriate practices for the specific materials used or stored onsite.

Spill Prevention and Control - Education

The following steps should be implemented to help reduce the impacts of leaks and spills:

1. Be aware that different materials pollute in different amounts. Ensure that each employee is aware of what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills.
2. Educate employees and sub-contractors on potential dangers to humans and the environment from spills and leaks.
3. Incorporate this training into regular safety meetings.
4. Establish a continuing education program to indoctrinate new employees.

Spill Prevention and Control - General Protection Measures

To the extent that work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR Parts 110,117, and 302, and sanitary and septic waste shall be contained at cleaned up immediately;

- Store hazardous materials and wastes in watertight covered containers and protect from vandalism;
- Keep material covered at all times excepting during active use;
- Place a stockpile of spill cleanup materials where it will be readily accessible;
- Train employees in spill prevention and cleanup;
- Spills should be covered and protected from storm water run-on during rainfall to the extent that it doesn't compromise cleanup activities;
- Do not bury or wash spills with water;
- Store and properly dispose of materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose;
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with the Waste Water Management Plan;
- 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; and
- 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.

Spill Prevention and Control - Clean Up

For small leaks, use common sense and be sure to clean 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 the used cleanup materials must be sent to either a certified laundry (rags) or disposed of as hazardous waste; and,

Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly.

Spill Prevention and Control - Minor Spills

Minor spills typically involve small quantities of oil, gasoline, paint, etc. that 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.

The following steps should be taken in the event of a minor spill:

1. Contain the spread of the spill.
2. Recover spilled materials.
3. Clean the contaminated area and properly dispose of contaminated materials.

Spill Prevention and Control - Semi-Significant Spills

Semi-significant spills can be controlled by the first responder along with the aid of other personnel. This response may require the cessation of all other activities.

The following steps should be taken in the event of a semi-significant spill:

1. Contain spread of spill.
2. Notify the Contractors Site Safety Officer (or QSP) immediately.
3. 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.
4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Spill Prevention and Control - Significant/Hazardous Spills

Notify the Contractors Site Safety Officer (or QSP/QSD) immediately. The Contractors Site Safety Officer (or QSP) shall organize and coordinate response personnel to contain and clean up the spill. Ensure personnel wear required personal protective equipment. The spilled material shall be properly identified to determine appropriate materials and methods for removal.

1. Contain/absorb all free liquid and residue, and dispose into hazardous waste containers.
2. Thoroughly decontaminate the spill area; treat all materials affected or used for cleanup as contaminated waste.

3. If any material entered any drains or waterways, perform decontamination of the lines.
4. Clean and inspect emergency response equipment.

The Contractors Site Safety Officer shall inspect the affected area and approve it ready for use prior to any personnel returning or work resuming in the area.

The Contractor shall be equipped to handle significant spills pursuant to this section.

For other significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, notify the local emergency response by dialing 911.

Solid and Hazardous Waste Management

Solid and Hazardous Waste Management as outlined in WM-5 and WM-6 shall be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes shall be loaded directly onto trucks for offsite disposal. When onsite storage is necessary, solid wastes shall be stored in watertight dumpsters in the general storage area of the contractor's yard.

Trash and waste associated with transients living along the trackway will require proper disposal. Contractor is advised to be cautious with any trash or waste which cannot be identified, and to contact local authorities as appropriate for the following potentially hazardous substances: needles or other material associated with intravenous drug use; containers with liquid that is unlabeled or otherwise unidentifiable; or possible drug manufacturing setups.

Contaminated Soil Management

If contaminated soils are encountered, the QSP shall be notified, the contaminated soils shall be contained, covered if stockpiled, and disposed of per the Contaminated Soil Management BMP. Employees shall be instructed to recognize evidence of contaminated soil, such as buried debris, discolored soil, and unusual odors.

Refer to the project Environmental Impact Report (EIR), the project Environmental Specifications, and the project Program Requirements for specific mitigation measures for contaminated soils.

Concrete Waste Management

Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout offsite or performing onsite washout in a designated area, and training employee and subcontractors. A temporary washout pit shall be implemented at the site during construction. Concrete washouts shall be contained so there is no discharge into the underlying soils or surrounding areas.

Sanitary-Septic Waste Management

Proper sanitary and septic waste management prevents the discharge of pollutants to storm water from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal. Avoid locating such facilities within 50 feet of a watercourse or storm drain inlet and anchor or secure facility to prevent tipping.

Due to the presence of transients along the trackway it is likely that construction activities may include areas with significant human fecal material and associated materials. Small incidences may possibly be removed by using hand tools or small equipment and placing material in plastic garbage bags in trash. If any significant or potentially hazardous conditions are found, contact

the local Public Health Department if within an urban boundary. If located in unincorporated areas, contact the County of Sonoma Permit & Resource Management Department or the County of Marin Public Health Department

Liquid Waste Management

Liquid waste management techniques shall be applied to construction activities that generate non-hazardous byproducts, residuals, or wastes, including drilling slurries and drilling fluids, grease-free and oil-free wastewater and rinse water, dredging, or any other non-storm water liquid discharges not permitted by separate permits.

3.4 POST CONSTRUCTION STORM WATER MANAGEMENT MEASURES

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

The General Permit (*Section XIII.A*) requires post-construction runoff reduction. The [Butte Regional Transit Operations Center](#) located in an area subject to a [Phase II](#) Municipal Separate Storm Sewer System (MS4) permit. The [Butte Regional Transit Operations](#) will meet post-construction runoff reduction requirements by implementing non-structural measures and runoff reduction credits using the water balance calculator (refer to *Appendix B Submitted Permit Registration Documents* for attached Water Balance Calculations).

Section 4 BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP INSPECTION AND MAINTENANCE

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 7.6. A blank inspection checklist can be found in Appendix I. Completed checklists shall be kept in Attachment 2 “Monitoring Records.”

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

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

4.2 RAIN EVENT ACTION PLANS

The Rain Event Action Plans (REAP) is a written document designed to be used as a planning tool by the QSP and the construction team to protect exposed portions of project sites and to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during the rain event. It is the responsibility of the QSP to be aware of precipitation forecast and to obtain and print copies of forecasted precipitation from NOAA’s National Weather Service Forecast Office.

Appendix F Construction Schedule includes a summary table of precipitation for the last 5 years (2007 to 2011), with average, minimum, & maximum counts for Qualifying & Non-Qualifying precipitation rates broken out by month.

The SWPPP includes REAP templates that the QSP will need to customize for each rain event. REAP templates for each applicable project phase can be found in Appendix J. The QSP shall maintain a paper copy of completed REAPs in compliance with the record retention requirements described in Section 1.5 of this SWPPP. Completed REAPs shall be maintained in Appendix J.

The QSP will develop an event specific REAP 48 hours in advance of a precipitation event forecast to have a 50% or greater chance of producing precipitation in the project area. The REAP will be onsite and be implemented 24 hours in advance of any the predicted precipitation event.

In the event that the NOAA forecast does not provide a minimum 48 hours advance notice of a precipitation event, the QSP is not obligated to provide a REAP. However, the QSP and the Contractor shall make all efforts to be prepared for the rain event, including preparing a REAP if possible.

At minimum the REAP will include the following site and phase-specific information:

1. Site Address;
2. Calculated Risk Level (2);
3. Contractors contact information including the name, company and 24-hour emergency telephone number;
4. Erosion and Sediment Control Provider information (if other than contractor) including the name, company and 24-hour emergency telephone number;
5. QSP and QSD information including the name, company, and 24-hour emergency telephone number;
6. Activities associated with each construction phase;
7. Trades active on the construction site during each construction phase;
8. Trade contractor information;
9. Recommended actions for each project phase.

Section 5 Training

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

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

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

Section 6 Responsible Parties and Operators

6.1 RESPONSIBLE PARTIES

The Legally Responsible Party (ies) and QSD are listed below:

Role	Name	Title	Phone Number
LRP	Andy Newsum	Deputy Director	530.879.2468
QSD	Steve Grupico	QSD, PE	707-523-1010

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

- Implementing all elements of the Construction General Permit and SWPPP:
 - Ensuring all BMPs are implemented, inspected, and properly maintained;
 - Performing non-storm water and storm water visual observations and inspections;
 - Performing non-storm water and storm sampling and analysis, as required;
 - Performing routine inspections and observations;
 - Implementing non-storm water management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP and/or QSD to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the Construction General Permit and approved plans at all times.
- Notifying the LRP and/or QSD immediately of off-site discharges or other non-compliance events.

6.2 SUB CONTRACTOR AND MATERIAL SUPPLIER LIST

Contractor shall provide a list of names and contact information all sub-contractors and material suppliers used by the Contractor to the QSP. The QSP shall keep a list of all sub-contractors and material suppliers, with contact information, in Appendix M. Contractor shall identify what service or material is being provided, and the expected

Section 7 Construction Site Monitoring Program

7.1 PURPOSE

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

1. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable NALs of the Construction General Permit;
2. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
3. To determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges;
4. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

7.2 APPLICABILITY OF PERMIT REQUIREMENTS

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

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-storm water discharges;
- Sampling and analysis of construction site runoff for pH and turbidity;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of non-storm water discharges when applicable.

7.3. WEATHER AND RAIN EVENT TRACKING

Visual monitoring, inspections, and sampling requirements of the General Permit are triggered by a qualifying rain event. The General Permit defines a qualifying rain event as any event that produces 0.5 inches of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

7.3.1 Weather Tracking

The QSP should daily consult the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at <http://www.srh.noaa.gov/>. Weather reports should be printed and maintained with the SWPPP in Attachment 1 “Weather Reports”.

When there is precipitation, the QSP shall ensure that storm precipitation data is obtained from the project site rain gauges listed in Section 7.3.2. Precipitation monitoring will determine the amount of precipitation within the 24 hour period and the total cumulative amount of precipitation for the storm event.

When a likely precipitation event was not forecasted to be a qualifying rain event, but the measured cumulative amount of precipitation for the storm event and the expected severity of the continuing storm event results in 0.5 inches or more of precipitation, the QSP will implement a REAP as soon as possible.

7.3.2 Rain Gauges

The nearest appropriate rain gauge(s) are located at:

- Chico, Municipal (KCIC) - <http://forecast.weather.gov/MapClick.php?CityName=Chico&state=CA&site=STO&lat=39.7158&lon=-121.815>

7.4 MONITORING LOCATIONS

Monitoring locations are shown on the WPCDs in Appendix B. Monitoring locations are further described in the Sections 7.6 and 7.7, and are listed in tabular form in Attachment 2 Monitoring - Monitoring Locations.

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

7.5 SAFETY AND MONITORING EXEMPTIONS

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

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours shall be as identified in the specifications.

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

7.6 VISUAL MONITORING

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

Table 7.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 7.6.3.

Table 7.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency
<i>Routine Inspections</i>	
BMP Inspections	Weekly ¹
BMP Inspections – Housekeeping	Daily
BMP Inspections – Tracking Control	Daily
BMP Inspections – Drain Inlet Protection	Daily
BMP Inspections – Perimeter Control	Daily
Non-Storm Water Discharge Observations	Quarterly during daylight hours
<i>Rain Event Triggered Inspections</i>	
Site Inspections Prior to a Qualifying Event	Within 48 hours of start of qualifying event ²
BMP Inspections During an Extended Storm Event	Every 24-hour period of a rain event ²
Site Inspections Following a Qualifying Event	Within 48 hours of end of qualifying event ²
¹ Most BMPs must be inspected weekly; those identified below must be inspected more frequently. ² Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation.	

7.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit. One visual inspection shall be conducted quarterly in each of the following periods: January - March, April-June, July-September, October-December.

7.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

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

7.6.1.2 Non-Storm Water Discharge Observations

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

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

7.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event, every 24-hour period during a qualifying rain event, and within 48 hours of the end of a qualifying rain event. Pre-rain inspections will be conducted after consulting NOAA weather forecasts and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

7.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event

Within 48-hours of a qualifying rain event a storm water visual monitoring site inspection will include observations of the following locations:

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

As necessary the QSP shall implement appropriate corrective actions before the qualifying rain event begins. Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

7.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event BMP inspections shall be conducted at least once every 24 hour period to identify and record:

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

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

7.6.2.3 Visual Observations Following a Qualifying Rain Event

Within 48 hours following a qualifying rain event (0.5 inches of rain) a storm water visual monitoring site inspection is required to observe:

- Identify whether BMPs were adequately designed, implemented, and effective;
- Identify additional BMPs that may be required, and revise the SWPPP accordingly;
- BMPs that require repair or replacement due to rain event damage;
- Identify BMPs which require maintenance to remove sediment, trash, etc... as necessary for proper function of the BMP;
- Inspect storm water storage or containment areas to detect leaks and verify that adequate freeboard remains;
- Discharge of stored or contained rain water.

7.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel and their training qualifications are provided in Appendix K.

Storm water observations shall be documented on the *Visual Inspection Field Log Sheet* in Attachment 3 “Example Forms”. BMP inspections shall be documented on the BMP inspection checklist. Any photographs used to document observations will be referenced on storm water site inspection reports and maintained with the Monitoring Records in Attachment 2. The completed reports will be kept in Attachment 2 “Monitoring Records”.

Within 10 days of the inspection the QSP shall submit copies of the completed inspection report to QSD.

7.6.4 Visual Monitoring Follow-Up and Reporting

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

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

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

Within 10 days of the inspection the QSP shall submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to the QSD.

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

7.7 WATER QUALITY SAMPLING AND ANALYSIS

7.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Storm Water Runoff Discharges

NON-VISIBLE POLLUTANT SAMPLING TRIGGERS

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

Refer to Appendix G and Section 2.6 for construction materials, wastes, or activities which are potential sources of non-visible pollutants to storm water discharges from the project.

There are no known existing site features that are potential sources of non-visible pollutants to storm water discharges.

The project also has the potential to receive storm water run-on with the potential to contribute non-visible pollutants to storm water discharges from the project. The majority of site run-on will be flow through culverts.

7.7.1.1 Sampling Criteria

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

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

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

7.7.1.2 Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence and use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations are shown on the WPCDs in Appendix B and in tabular form in Attachment A.

Non-Visible Pollutant Sample Locations – Contractors' Yard

See Attachment 2 Monitoring Locations

Sampling location(s) on the project site and the contractor's yard have been identified for the collection of samples of runoff from planned material and waste storage areas and areas where non-visible pollutant producing construction activities are planned.

Non-Visible Pollutant Sample Locations – Areas of Historical Contamination

See Attachment 2 Monitoring Locations

No sampling locations have been identified for the collection of samples of runoff from areas of historical contamination that have the potential to affect water quality.

Non-Visible Pollutant Sample Locations – Background (Unaffected Sample)

See Attachment 2 Monitoring Locations

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

Non-Visible Pollutant Sample Locations – Site Run-On

See Attachment 2 Monitoring Locations

Sampling locations have been identified for the collection of samples of run-on to the project site. Run-on from these locations has the potential to combine with discharges from the site being sampled for non-visible pollutants. These samples are intended to identify potential sources of non-visible pollutants that originate off the project site.

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

7.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor Yes No

Consultant/QSP Yes No

The Consultant/QSP may collect samples for laboratory analysis as directed by Laboratory.

Laboratory Yes No

Samples on the project site will be collected by the XXXXXX Team and analyzed at the following location:

- Laboratory Name: XXXXX
- Address: XXXXX, California 95928
- Phone: (530) XXX-XXXX
- Fax: (530) XXX-XXXX fax
- Point of Contact: TBD
- Primary Sampler: TBD
- Alternate Sampler: TBD

If one of the triggering conditions is identified during an inspection the QSP shall ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.1.4 Analytical Constituents

Appendix G Construction Activities, Materials Used, Associated Pollutants and Indicators lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

7.7.1.5 Sample Collection

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

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, “Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants” provided in Section 7.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP shall collect samples.

Sample collection and handling requirements are described in Section 7.7.7.

7.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 7.20.

Samples will be analyzed by: XXXXX Chico CA

Samples will be delivered to the laboratory by:

- | | | | | |
|---------------------------------|-------------------------------------|-----|--------------------------|----|
| Driven by Consultant/QSP | <input checked="" type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Picked up by Laboratory Courier | <input checked="" type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Shipped | <input checked="" type="checkbox"/> | Yes | <input type="checkbox"/> | No |

The most expedient and appropriate sample delivery method shall be utilized.

7.7.1.7 Data Evaluation and Reporting

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

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

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

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

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

7.7.2 Sampling and Analysis Plan for pH and Turbidity in Storm Water Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is required for this project. This Sampling and Analysis Plan describes the strategy for monitoring turbidity and pH for storm water runoff discharges from the project site and run-on in relation to NALs.

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

7.7.2.1 Sampling Schedule

Storm water runoff samples shall be collected for pH from all qualifying rain events that result in a discharge from the project site. At minimum, pH samples will be collected from each site discharge location during project phases and drainage areas with a high risk of pH discharge such as near concrete work or soil amendments. A minimum of three samples will be collected per day of discharge during a qualifying event. Samples should be representative of the total discharge from the location each day of discharge during the qualifying event. Typically representative samples will be spaced in time throughout the daily discharge event. If the discharge event is short in duration, collect a minimum of three samples across the site.

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

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

7.7.2.2 Sampling Locations

Sampling locations are based on the site runoff discharge locations and locations where run-on enters the site; accessibility for sampling; and personnel safety. Planned pH and turbidity sampling locations are shown on the WPCDs in Appendix B and in tabular form in Attachment A. The tabular form includes the Sample Point ID identified in the WPCDs with coordinates shown in both WGS84 latitude/longitude and NAD83 Zone 3 feet. One hundred fifty two (152) sampling locations have been identified on the WPCDs. The sample point Location and Description fields are to be populated using GIS methods during the initial site inspections.

Turbidity and pH Runoff Sample Locations

See Attachment 2 Monitoring Locations

Sampling location(s) on the project site and the contractor's yard have been identified for the collection of runoff samples.

Turbidity and pH Run-On Sample Locations

See Attachment 2 Monitoring Locations

Sampling locations have been identified for the collection of run-on samples where the run-on has the potential to contribute to an exceedance of a NAL.

7.7.2.3 Monitoring Preparation

Turbidity and pH samples will be collected and analyzed by:

Contractor Yes No
 Consultant/QSP Yes No
 Laboratory Yes No

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

7.7.2.4 Field Parameters

Samples shall be analyzed for pH and turbidity as indicated in Table 7.13

Table 7.2 Sample Collection and Analysis for Monitoring Turbidity and pH

Parameter	Test Method	Minimum Sample Volume ⁽¹⁾	Sample Collection Container Type	Detection Limit (minimum)
Turbidity	Field meter/probe with calibrated portable instrument	500 mL	Polypropylene or Glass (Do not collect in meter sample cells)	1 NTU
pH	Field meter/probe with calibrated portable instrument	100 mL	Polypropylene	0.2 pH units
Notes: ¹ Minimum sample volume recommended. Specific volume requirements will vary by instrument; check instrument manufacturer instructions. mL – Milliliter NTU – Nephelometric Turbidity Unit				

7.7.2.5 Sample Collection

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

Only personnel trained in water quality sampling and field measurements working under the direction of the QSP shall collect samples. Sample collection and handling requirements are described in Section 7.7.7.

7.7.2.6 Field Measurements

Prior to analysis, field meters shall be calibrated in accordance with manufacturer’s specifications. Samples for field analysis shall then be tested in accordance with the field instrument instructions, and the results recorded on *Effluent Sampling Field Log Sheets* forms provided in Attachment 3 “Example Forms”.

The field instrument(s) listed in Table 7.14, or approved equal, will be used to analyze the following constituents:

Table 7.3 Field Instruments

Field Instrument (Manufacturer and Model)	Constituent
Oakton pHTestr 20	pH
Oakton T-100	Turbidity

The manufacturers’ instructions/operations and maintenance manuals are included in Attachment 4 “Field Meter Instructions”. Field sampling staff shall review the instructions prior to each sampling event and follow the instructions in completing measurement of the samples.

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

The QSP may authorize alternate equipment provided that the equipment meets the Construction General Permit’s requirements and the manufacturers’ instructions for calibration and use are added to Attachment 4 “Field Meter Instructions”.

7.7.2.7 Data Evaluation and Reporting

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

Numeric Action Levels

This project is subject to NALs for pH and turbidity (Table 7.15). Compliance with the NAL for pH and turbidity is based on a daily average. Upon receiving the field log sheets, the QSP shall immediately calculate the arithmetic average of the pH and turbidity samples to determine if the NALs, shown in the table below, have been exceeded.

Table 7.4 Numeric Action Levels

Parameter	Unit	Daily Average
pH	pH units	Lower NAL = 6.5 Upper NAL = 8.5

Table 7.4 Numeric Action Levels

Parameter	Unit	Daily Average
Turbidity	NTU	250 NTU

The QSP shall within 10 days of the sample collection submit copies of the completed *Effluent Sampling Field Log Sheets* to QSD.

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

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

- Analytical method(s), reporting unit(s), and detection limits of each parameter;
- Date, place, time of sampling, visual observation, and/or measurements, including precipitation; and
- Description of the current BMPs associated with the sample that exceeded the NAL and the proposed corrective actions taken.

7.7.3 Sampling and Analysis Plan for Non-Storm Water Discharges

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

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

There are no authorized non-storm water discharges that have the potential to be discharged from the project site.

Some construction activities have the potential to result in an unplanned (unauthorized) non-storm water discharge if BMPs fail. These activities include:

-
- Concrete curing;
 - Dust Control;
 - Equipment cleaning or washing.
-

7.7.3.1 Sampling Schedule

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

7.7.3.2 **Sampling Locations**

Samples shall be collected from the discharge point of the construction site where the non-storm water discharge is running off the project site.

7.7.3.3 **Monitoring Preparation**

Non-storm water discharge samples will be collected by:

Contractor	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Consultant/QSP	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Laboratory	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

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

Samples on the project site will be collected by the QSP or his/her designee.

As necessary the QSP or his/her designee will contact Analytical Services Laboratory of Petaluma, 24 hours prior to a planned non-storm water discharge or as soon as an unplanned non-storm water discharge is observed. The QSP shall ensure that adequate sample collection personnel, supplies for non-storm water discharge monitoring are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

7.7.3.4 **Analytical Constituents**

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

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

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

Table 7.20 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

7.7.3.5 **Sample Collection**

Samples shall be collected at the discharge locations where the non-storm water discharge is leaving the project site. Potential discharge locations are shown on the WPCSs in Appendix B.

Grab samples shall be collected and preserved in accordance with the methods identified in Table 7.20. Only personnel trained in water quality sampling under the direction of the QSP

shall collect samples. Sample collection and handling requirements are described in Section 7.7.7.

7.7.3.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in Table 7.20.

7.7.3.7 Data Evaluation and Reporting

The QSP shall complete an evaluation of the water quality sample analytical results. Turbidity and pH results shall be evaluated for compliance with NALs as identified in Section 7.7.2.7.

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

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

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

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

7.7.4 Sampling and Analysis Plan for Other Pollutants Required by the RWQCB

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

7.7.5 Training of Sampling Personnel

Sampling personnel shall collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPP). Certified QSDs and QSPs may collect samples according to section 7.7.6 and 7.11 and per collection instructions from the analytical laboratory. QSD and QSP certificates are included in Appendix L Responsible Parties.

7.7.6 Sample Collection and Handling

7.7.6.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the WPCDs in Appendix B and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPP). Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

- For small streams and flow paths, simply dip the bottle facing upstream until full.
- For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
- For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
- Avoid collecting samples from ponded, sluggish or stagnant water.
- Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

7.7.6.2 Sample Handling

Turbidity and pH measurements must be conducted immediately. Do not store turbidity or pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

7.7.6.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be erased or obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

7.8 ACTIVE TREATMENT SYSTEM MONITORING

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

7.9 BIOASSESSMENT MONITORING

This project is NOT subject to bioassessment monitoring.

7.10 WATERSHED MONITORING OPTION

This project is NOT participating in a watershed monitoring option.

7.11 QUALITY ASSURANCE AND QUALITY CONTROL

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the Water Quality Program to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

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

7.11.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log and an Effluent Sampling Field Log Sheet are included in Attachment 3 “Example Forms”.

7.11.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 7.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

7.11.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in Attachment 3 “Example Forms”.

7.11.4 QA/QC Samples

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

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

7.11.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected

from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

7.11.5 Data Verification

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

- Check the CoC and laboratory reports.
Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

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

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

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

7.12 RECORDS RETENTION

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

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

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

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections; and
- NAL Exceedance Reports.

Table 7.5 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Storm Water Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
Ammonia	EPA 350.3	100 mL	Glass	Refer to Laboratory		
Arsenic	EPA 7060A	250 mL	Polypropylene	Refer to Laboratory		
Battery Acid	Visual Observation of cracked, broken, or malfunctioning battery case					
BOD	EPA 405.1	500 mL	Polypropylene	Store at 4°C	1 mg/L	48 hours
Chlorine, Chloramine	SM 4500	500 mL	Polypropylene	Do not expose to light	0.1 mg/L	Immediate
COD	EPA 410.4	500 mL	Glass-Amber	Store at 4°C, H ₂ SO ₄ to pH<2	10 mg/L	28 days
Construction Debris	Visual Observation of Debris					
Creosote	Visual Observation of Creosote Coating on Timber Products (ties, pilings, etc.)					
Diesel	EPA 8015BB	1 L	Glass-Amber	Store at 4°C	50 µg/L	14 days
Formaldehyde	EPA 8315A	100 mL	Glass	Refer to Laboratory		
Gasoline	EPA 8015B	3 x 40 mL	VOA-Glass	Store at 4°C, HCl to pH<2	50 µg/L	14 days
MBA's, anionic surfactants (detergents)	Visual Observation of Foaming, Bubbles, or Sheen. If needed, use USEPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983), or, APHA Standard Methods, 21st ed., Method 5540 C (2005), or, ASTM D 2330-02 , Methylene Blue Active Substances.					
Metals (Al, Cr, Cu, V, Zn)	EPA 200.8	250 mL	Polypropylene	Store at 4°C	0.2 µg/L	6 months
Nitrates	EPA 300.0	500 mL	Glass	Store at 4°C	0.1 mg/L	14 days
Nitrites	EPA 300.0					
Nitrogen	EPA 351.3	100 mL	Glass	Store at 4°C	0.1 mg/L	28 days

Table 7.5 Sample Collection, Preservation and Analysis for Monitoring Pollutants in Non-Storm Water Discharges

Constituent	Analytical Method	Minimum Sample Volume	Sample Bottle	Sample Preservation	Reporting Limit	Maximum Holding Time
Oil and Grease	EPA 1664A	500 mL	Glass-Amber	Refer to Laboratory		28 days
Paint	Visual Observation of Leaking Containers, Washout, or Spills					
pH	EPA 150.1	100 mL	Polypropylene	None	0.01	Immediate
Phenols	EPA 420.1	500 mL	Glass-Amber	Store at 4°C, H ₂ SO ₄ to pH<2	0.1 mg/L	28 days
Phosphate	EPA 300.0	100 mL	Polypropylene	Store at 4°C	0.1 mg/L	48 hours
Potassium	EPA 200.7	Refer to Laboratory				
Sulfate	EPA 300.0	250 mL	Polypropylene	Store at 4°C	0.1 mg/L	28 days
SVOCs	EPA 8270C	1 L	Glass-Amber	Store at 4°C	10 µg/L	7 days
Synthetic Organics ¹	Refer to VOC or SVOC Notes					
TDS	EPA 160.1	100 mL	Polypropylene	Store at 4°C	1 mg/L	7 days
VOCs	EPA 8260B	3 x 40 mL	VOA-Glass	Store at 4°C, HCl to pH<2	1 µg/L	14 days
¹ Synthetic Organics are defined in Table 1.2 of the CASQA <i>Stormwater BMP Handbook Portal: Construction</i> as adhesives, cleaners, sealants, solvents, etc. These are generally categorized as VOCs or SVOCs.						
<u>Acronyms:</u> BOD - Biological Oxygen Demand COD - Chemical Oxygen Demand MBAs - Methylene Blue Active Substances			<u>Acronyms:</u> SVOC - Semi Volatile Organic Compound TDS - Total Dissolved Solids VOC - Volatile Organic Compound			

Section 8 References

State Water Resources Control Board 2009: Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities, as amended by Order 2010-0014-DWQ NPDES NO. CAS000002. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

CASQA 2009, *Stormwater BMP Handbook Portal: Construction*, November 2009, www.casqa.org

Caltrans Statewide Stormwater Program
<http://www.dot.ca.gov/hq/env/stormwater/>

APPENDIX A: CALCULATIONS

APPENDIX A1: Risk Analysis

Combined Risk Level Matrix

		<u>Sediment Risk</u>		
		Low	Medium	High
<u>Receiving Water Risk</u>	Low	Level 1	Level 2	
	High	Level 2		Level 3

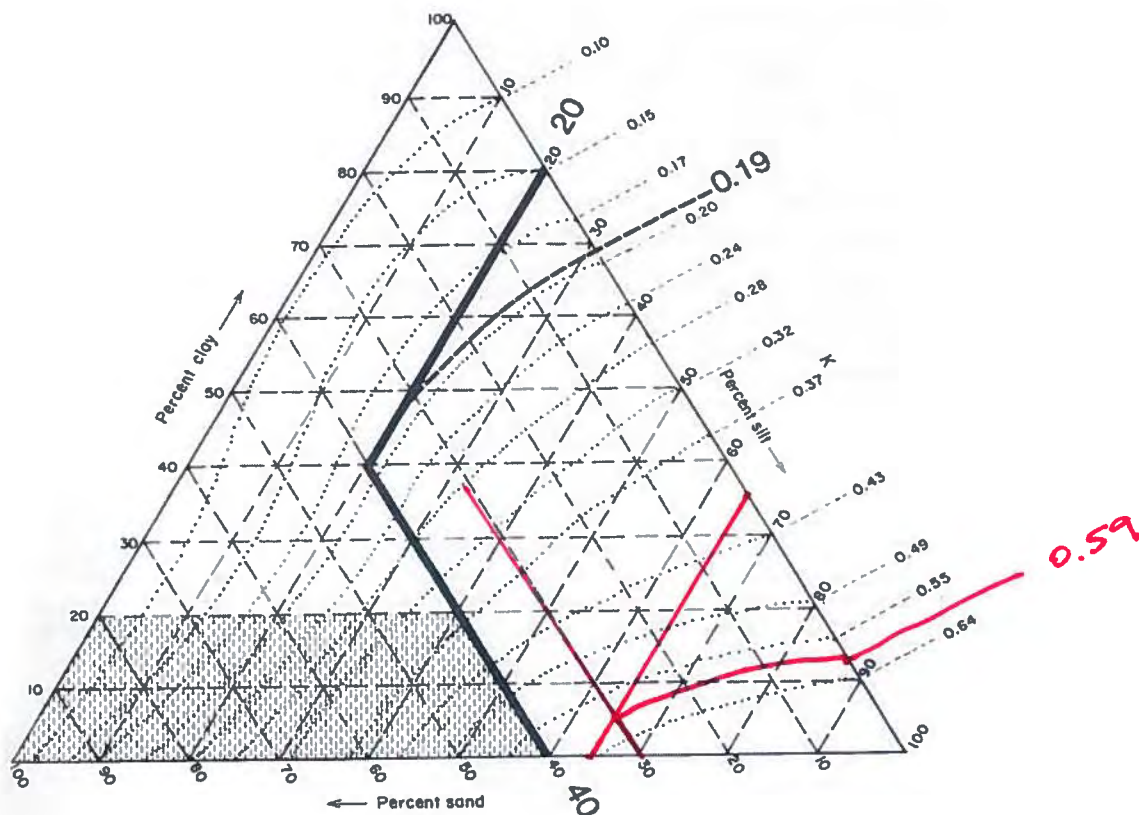
Project Sediment Risk: **Low**
Project RW Risk: **High**
Project Combined Risk: **Level 2**

	A	B	C
1	Sediment Risk Factor Worksheet		Entry
2	A) R Factor		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5		R Factor Value	46
6	B) K Factor (weighted average, by area, for all site soils)		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9		K Factor Value	0.59
10	C) LS Factor (weighted average, by area, for all slopes)		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13		LS Factor Value	0.12
14			
15	Watershed Erosion Estimate (=RxKxLS) in tons/acre		3.2568
16	Site Sediment Risk Factor		Low
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			
21			
22			
23	GIS Map Method:		
24	1. The R factor for the project is calculated using the online calculator at:		
25	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
26			
27	2. The K and LS factors may be obtained by accessing the GIS maps located on the State Water Board FTP website at:		
28	ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwg/cgp/Risk/		

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	yes/no	
A.1. Does the disturbed area discharge (either directly or indirectly) to a 303(d)-listed waterbody impaired by sediment (For help with impaired waterbodies please visit the link below) or has a USEPA approved TMDL implementation plan for sediment ?:	yes	High
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan)		
http://www.waterboards.ca.gov/waterboards_map.shtml		
Region 1 Basin Plan Region 2 Basin Plan Region 3 Basin Plan Region 4 Basin Plan Region 5 Basin Plan Region 6 Basin Plan Region 7 Basin Plan Region 8 Basin Plan Region 9 Basin Plan		

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Sheet Flow Length (ft)	Average Watershed Slope (%)							
	0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

APPENDIX A2: Project Area Calculations

SITE SIZE & DISTURBED AREA ESTIMATE		
<u>Description</u>	<u>Square Feet</u>	<u>Acres</u>
Project SITE		
	435,600	10.0
Total Project Site Area	435,600	10.0
Disturbed Areas	435,600	10.0
Total Project Disturbed Area	435,600	10.0

***APPENDIX A3: Site Storm Drainage Report
(Post Construction H&H Calculations)***



Butte County Association of Governments

Butte Regional Transit
Operations Center Project

Site Storm Drainage

June 2014

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Appendices

- Appendix A - Hydrology
- Appendix B – Hydraulics

1. Introduction

GHD was retained by TLCD Architecture to provide civil, mechanical, electrical and plumbing engineering services for the Butte Regional Transit Operations Center Project (project). As part of the project, a drainage study has been conducted to address the anticipated post-construction storm water flow rates as well as “Best Management Practices” (BMPs) necessary to manage storm water quantity and quality and protect downstream receiving water bodies.

GHD reviewed and analyzed background information pertinent to the project. The background information includes hydrology, hydraulic and water quality design criteria, existing storm drain infrastructure records and existing topographic information.

The storm drain system and related facilities presented in this study were developed using information available at the time this report was prepared. The hydrologic, hydraulic and water quality analyses, as well as the design, were developed and completed in accordance with the provisions and requirements of the City of Chico Municipal Code Title 18R Design Criteria and Improvement Standards ⁽¹⁾. The design of project is also intended to meet sustainability requirements for certification through the LEED green building program ⁽²⁾.

The construction activities are also required to conform to the State of California Construction General Permit ⁽³⁾ for the Storm Water Pollution Prevention Plan (SWPPP) which will be prepared as part of the Contract Document.

The existing site consists of approximately 10 acres of generally open fields. Topography is relatively flat with an approximate 0.5% slope from east to west.

The proposed project includes site development to construct a new administration, operation and maintenance buildings, visitor and staff parking lots, bus parking area, and ancillary improvements.

There is an existing 36-inch storm drain pipe running along the east side of Huss Drive, however the City does not allow the site runoff to be discharged into this storm drain line. As part of the project, a new outfall will be constructed with sufficient capacity to convey runoff from the project site and surrounding parcels into Comanche Creek.

2. Hydrology

In order for the project to achieve LEED points for post-construction storm water quantity and quality, it must “implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the 2-year 24-hour design storms for sites with existing imperviousness 50% or less” ⁽²⁾. This LEED criteria is also in conformance with City of Chico’s Municipal Code for post-construction volumetric treatment control BMPs requirements.

The County standards recommend utilizing the rational method for estimating design storm runoff. However, the analysis for this site requires developing runoff volumes as well as peak flows. Therefore TR-55 methodology is used as described below.

The US Department of Agriculture (USDA) TR-55 ⁽⁴⁾ is utilized to determine the peak flow rate and volume of storm runoff from the project site. This method begins with a rainfall depth uniformly imposed on the watershed over a specific time distribution. Rainfall is then converted to runoff by using a runoff curve number (CN). Lastly, runoff is transformed into a hydrograph by using unit hydrograph theory and routing procedures that depend on runoff travel time through areas and segments of the watershed. The following sections describe the parameters used to compute peak discharge and runoff volume.

2.1 Watershed Delineation

The pre-development and post-development site is divided into eleven (11) sub-watersheds, including one off-site sub-shed, based on the rough grading plan as presented in Table 2-1. These drainage areas are shown on Figure 1.

Table 2.1 Sub-watershed Characteristics

Parcel #	Parcel Name					Existing Conditions			Developed Conditions		
		Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft ²)	Total Area (Ac)	Weighted Curve Number	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft ²)	Total Area (Ac)	Weighted Curve Number
1	BLG	1,502	0	1502	0.03	98	1,502	0	1502	0.03	98
2	2.1	12,385	2,790	15175	0.35	95	12,385	2,790	15175	0.35	95
3	BLG	8,008	0	8008	0.18	98	8,008	0	8008	0.18	98
4	1.1	10,777	4,074	14851	0.34	93	10,777	4,074	14851	0.34	93
5	1.3	17,065	3,495	20560	0.47	95	17,065	3,495	20560	0.47	95
6	1.2	11,605	2,407	14012	0.32	95	11,605	2,407	14012	0.32	95
7	2.2	10,651	270	10921	0.25	98	10,651	270	10921	0.25	98
8	1.7	8,685	17,463	26148	0.60	85	8,685	17,463	26148	0.60	85
9	2.3	29,345	12,010	41355	0.95	92	29,345	12,010	41355	0.95	92
10	3.3	22,918	900	23818	0.55	97	22,918	900	23818	0.55	97
11	3.2	25,435	980	26415	0.61	97	25,435	980	26415	0.61	97
12	1.5	7,311	18,301	25612	0.59	84	7,311	18,301	25612	0.59	84
13	1.6	4,775	16,955	21730	0.50	83	4,775	16,955	21730	0.50	83

Parcel #	Parcel Name	Paved Area (sf)				Existing Conditions			Developed Conditions		
			Unpaved Area (sf)	Total Area (Ft ²)	Total Area (Ac)	Weighted Curve Number	Paved Area (sf)	Unpaved Area (sf)	Total Area (Ft ²)	Total Area (Ac)	Weighted Curve Number
14	3.1	12,000	13,168	25168	0.58	88	25,168	0	25168	0.58	98
15	BLG	1,920	0	1920	0.04	98	1,920	0	1920	0.04	98
16	1.4	16,688	4,587	21275	0.49	94	16,688	4,587	21275	0.49	94
17	BLG	5,590	0	5590	0.13	98	5,590	0	5590	0.13	98
18	3.4	18,090	500	18590	0.43	97	18,090	500	18590	0.43	97
19	BLG	3,344	0	3344	0.08	98	3,344	0	3344	0.08	98
20	4.1	51,730	6,945	58675	1.35	96	51,730	6,945	58675	1.35	96
21	BLG	2,428	0	2428	0.06	98	2,428	0	2428	0.06	98
22	BLG	2,139	0	2139	0.05	98	2,139	0	2139	0.05	98
23	BLG	11,178	0	11178	0.26	98	11,178	0	11178	0.26	98
24	BLG	1,953	0	1953	0.04	98	1,953	0	1953	0.04	98
25	BLG	4,211	0	4211	0.10	98	4,211	0	4211	0.10	98
26	BLG	1,795	0	1795	0.04	98	1,795	0	1795	0.04	98
Total		303,528	104,845	408,373	9.37	93	316,696	91,677	408,373	9.37	94

2.2 Rainfall Events

The 24-hour SCS Hypothetical Storm method is utilized in TR-55 model. This method requires the 24-hour rainfall amount associated with a specific storm frequency. The method also requires the determination of a rainfall distribution. The SCS has defined four distributions within the United States based on storm intensity. TR-55 includes four rainfall distributions based on the geographic regions. Northern California with wet winters and dry summers is represented by Type IA distribution. The 24-hour rainfall depths are obtained from NOAA Atlas 14, Volume 6, Version 2, and presented in Table 2.2.

Table 2.2 Rainfall Characteristics ⁽⁵⁾

Rainfall Return Period (yr)	24-hr Rainfall Amount (in)
2	2.81
10	4.45
100	6.49

2.3 Soil Characteristics and Land Use

The major factors that determine CN are the hydrologic soil group, cover type and antecedent runoff conditions. The Natural Resource Conservation Service classifies soils into four hydrologic soil groups (A, B, C and D) according to their minimum infiltration rate. The surface soil in the project area is identified as Chico loam (hydrologic group B) from the "Soil Survey of Butte Area, California, Parts of Butte and Plumas Counties" ⁽⁶⁾.

Antecedent moisture conditions are classified as either low (AMC I), average (AMC II), or high (AMC III). For the purpose of this study, it is assumed that AMC II curve numbers be applied. AMC

II assumes that 0.5-inches to 1.1-inches of rain had fallen in the watershed of interest over the course of 5-days prior to the initiation of the design storm. Curve numbers developed for AMC II are the most widely used in hydrologic analysis when utilizing the SCS method. Table 2.3 shows the curve numbers used in the hydrologic analyses.

Table 2.3 CN Values

Condition	Cover Type	Curve Number
Pre-development	Open Space – poor condition (grass cover < 50%)	79
Post-development	Paved parking lots, roofs, driveways	98

2.4 Time of Concentration

The time of concentration (T_c) is the time required for surface runoff from the most remote part of the drainage area to reach the design point. T_c is the sum of the sheet flow time, shallow concentrated flow time and the open channel/pipe flow time.

$$T_c = T_{t(\text{sheet})} + T_{t(\text{shallow concentrated})} + T_{t(\text{channel})}$$

Based on the City of Chico’s standards, minimum time of concentration of 20 minutes and 10 minutes are used respectively for pre- and post-development runoff calculations.

2.5 Hydrology Modeling

The modeling software used to calculate peak discharge is WinTR-55, a single-event rainfall-runoff small watershed hydrologic model. Two models are created to calculate pre- and post-development runoff rates and volumes for 2-yr, 24-hour, 10-yr, 24 hour and 100-yr, 24 hour storms. Tables 2.4 and 2.5 summarize the hydrology results for pre- and post-development conditions for the drainage areas shown on Figure 1.

Table 2.4 Existing Condition Flow Rates

Existing Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs)	Peak Flow 10-yr (cfs)	Peak Flow 100-yr (cfs)
1	BLG	0.03	0.00	0.00	0.00
2	2.1	0.35	0.32	0.55	0.83
3	BLG	0.18	0.25	0.40	0.58
4	1.1	0.34	0.24	0.42	0.64
5	1.3	0.47	0.27	0.47	0.70
6	1.2	0.32	0.19	0.32	0.48
7	2.2	0.25	0.16	0.26	0.39
8	1.7	0.60	0.12	0.31	0.59
9	2.3	0.95	0.19	0.50	0.93
10	3.3	0.55	0.11	0.29	0.54

Existing Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs)	Peak Flow 10-yr (cfs)	Peak Flow 100-yr (cfs)
11	3.2	0.61	0.12	0.32	0.60
12	1.5	0.59	0.12	0.31	0.58
13	1.6	0.50	0.10	0.26	0.49
14	3.1	0.58	0.24	0.47	0.77
15	BLG	0.04	0.00	0.00	0.00
16	1.4	0.49	0.10	0.26	0.49
17	BLG	0.13	0.00	0.07	0.13
18	3.4	0.43	0.09	0.22	0.42
19	BLG	0.08	0.00	0.00	0.08
20	4.1	1.35	0.27	0.71	1.33
21	BLG	0.06	0.00	0.00	0.06
22	BLG	0.05	0.00	0.00	0.05
23	BLG	0.26	0.05	0.14	0.26
24	BLG	0.04	0.00	0.00	0.00
25	BLG	0.10	0.00	0.05	0.10
26	BLG	0.04	0.00	0.00	0.00
Total		9.37	5.02	8.89	13.67

Table 2.5 Proposed Condition Flow Rates

Developed Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs0)	Peak Flow 10-yr (cfs0)	Peak Flow 100-yr (cfs0)
1	BLG	0.03	0.00	0.00	0.00
2	2.1	0.35	0.32	0.55	0.83
3	BLG	0.18	0.25	0.40	0.58
4	1.1	0.34	0.24	0.42	0.64
5	1.3	0.47	0.27	0.47	0.70
6	1.2	0.32	0.19	0.32	0.48
7	2.2	0.25	0.16	0.26	0.39
8	1.7	0.60	0.20	0.43	0.74
9	2.3	0.95	0.48	0.87	1.36
10	3.3	0.55	0.35	0.57	0.84
11	3.2	0.61	0.39	0.63	0.93
12	1.5	0.59	0.18	0.41	0.71
13	1.6	0.50	0.15	0.33	0.58
14	3.1	0.58	0.38	0.61	0.90
15	BLG	0.04	0.00	0.00	0.06
16	1.4	0.49	0.28	0.48	0.73

Developed Conditions					
Parcel #	Parcel Name	Total Area (Ac)	Peak Flow 2-yr (cfs0)	Peak Flow 10-yr (cfs0)	Peak Flow 100-yr (cfs0)
17	BLG	0.13	0.08	0.13	0.20
18	3.4	0.43	0.27	0.44	0.66
19	BLG	0.08	0.05	0.09	0.13
20	4.1	1.35	0.83	1.38	2.05
21	BLG	0.06	0.00	0.06	0.09
22	BLG	0.05	0.00	0.05	0.08
23	BLG	0.26	0.17	0.28	0.41
24	BLG	0.04	0.00	0.00	0.06
25	BLG	0.10	0.07	0.11	0.16
26	BLG	0.04	0.00	0.00	0.06
Total		9.37	5.27	9.13	13.88

As it is shown in Tables 2.4 and 2.5, the development increased the total runoff by 2.69 cfs, 3.28 cfs and 3.60 cfs for 2-year, 10-year and 100-year storms respectively. The detail results from hydrology modeling are presented in Appendix A.

DRAFT

3. Water Quality

Best Management Practices (BMPs) are incorporated into the design by maximizing opportunities to utilize landscaped areas to attenuate stormwater flows, improve water quality, and minimize the effect of impervious improvements.

City of Chico requires storm water treatment controls in new and redevelopment projects. The post construction treatment control BMPs shall incorporate either a volumetric or flow base control design for the 85th percentile 24-hour runoff event which is equivalent to the measures listed in LEED certification criteria as described in Chapter 2.

3.1 BMP Design

A series of bioswales with bioretention mechanisms throughout the site function as soil and plant-based filtration, retention, and infiltration features to achieve both water quality and volume capture objectives. Figure 1 shows the developed site and proposed bioswales and bioretention system layout. The locations of the swales and bioretention facilities are governed by the grading plan as presented in Figure 2.

Bioretention facilities are located in the median areas of the parking lots and around the perimeter of the site, and have suitable access for inspection and maintenance.

Runoff generated from each sub-watershed is conveyed via sheet flow and shallow concentrated flow to the bioswales. Stormwater infiltrates into the subsurface bioretention system where it is filtered, undergoes biological treatment, and infiltrates into the subsurface. The following design criteria are assumed for sizing the bioretention systems:

- The porosity of the structural soil within the bioretention area is 0.4;
- The depth of the structural soil is minimum 30 inches;
- The swales on the top of bioretention areas are generally trapezoidal in shape with smoothed edges, 7 feet-wide base, maximum depth of 12 inches, 3 to 1 side slopes and 0.2% longitudinal slope.

Bioretention facilities capture and infiltrate 100% of the volume of runoff generated by a 2-year 24-hour storm event; therefore no additional treatment is required. They are also sized to convey 100% of the flow generated by a 10-year 24-hour storm event. Table 3.1 summarizes the water quality sizing calculations for bioretention facilities. Bioretention facilities are shown on Figure 1.

Table 3.1 Biofiltration Facility Characteristics

Estimated Storage Volume per Parcel								
Parcel #	Parcel Name	Developed Conditions Storage Volume Ac-Ft	Existing Conditions Storage Volume Ac-Ft	Delta Storage Volume (Ac-Ft)	Delta Storage Volume (CF)	Delta TDA Volume (CF)	Calc Storage Area (SF)	Actual Length (FT)
1	BLG	0.000	0.000	0.000	0	0	0	0
2	2.1	0.065	0.065	0.000	0	0	0	0
3	BLG	0.035	0.035	0.000	0	0	0	0
4	1.1	0.033	0.033	0.000	0	0	0	0

Estimated Storage Volume per Parcel								
Parcel #	Parcel Name	Developed Conditions Storage Volume Ac-Ft	Existing Conditions Storage Volume Ac-Ft	Delta Storage Volume (Ac-Ft)	Delta Storage Volume (CF)	Delta TDA Volume (CF)	Calc Storage Area (SF)	Actual Length (FT)
5	1.3	0.043	0.043	0.000	0	0	0	155
6	1.2	0.018	0.018	0.000	0	0	0	85
7	2.2	0.014	0.014	0.000	0	0	0	0
8	1.7	0.027	0.011	0.017	726	1116	372	140
9	2.3	0.149	0.058	0.091	3974	6113	1019	120
10	3.3	0.075	0.009	0.066	2880	4431	1108	0
11	3.2	0.094	0.011	0.083	3597	5534	1383	0
12	1.5	0.023	0.010	0.013	566	870	218	285
13	1.6	0.012	0.007	0.005	228	351	88	210
14	3.1	0.091	0.037	0.053	2330	3585	896	0
15	BLG	0.000	0.000	0.000	0	0	0	0
16	1.4	0.046	0.007	0.039	1714	2638	659	195
17	BLG	0.004	0.000	0.004	165	254	51	88
18	3.4	0.043	0.004	0.038	1661	2555	639	0
19	BLG	0.001	0.000	0.001	59	90	30	70
20	4.1	0.262	0.115	0.147	6410	9862	1972	87
21	BLG	0.000	0.000	0.000	0	0	0	65
22	BLG	0.000	0.000	0.000	0	0	0	90
23	BLG	0.015	0.001	0.014	605	930	233	0
24	BLG	0.000	0.000	0.000	0	0	0	52
25	BLG	0.002	0.000	0.002	104	160	64	90
26	BLG	0.000	0.000	0.000	0	0	0	35

4. Hydraulics

The closed conduit storm drain system presented herein is designed to convey the required 10-year 24-hour storm event below the top of grate of the drainage inlets. The flow results of the hydrologic analysis are utilized as inputs to analyze the hydraulics of the storm drain system. The purpose of the hydraulic analysis is to evaluate and design adequately sized swales, conduits and drainage inlets for conveyance of the design storm event.

4.1 Bioswale Design

Runoff from parking areas and buildings is drained toward the swales and bioretention facilities which are designed to accommodate the overland flow. The swales above the bioretention areas are sized using Manning's equation for the peak runoff rate generated by a 100-year 24-hour. They are generally trapezoidal in shape with smoothed edges, ranging from 3-feet to 12 feet-wide at the base, minimum depth of 12 inches, maximum 3:1 side slopes and a maximum 0.5% longitudinal slope.

4.2 Closed Conduits Design

Stormwater flows beyond the bioretention capacity enter closed conduit storm drains via drop inlets located in bioswales. The closed conduit storm drain system is simulated using Haestad Method's StormCAD V8i. The hydraulic design utilizes Manning's equation to relate depth of flow in the waterway to the flow rate (Q), cross sectional area (A), slope (S) and roughness of the conduit (Manning's roughness coefficient "n").

Runoff flow rates computed from hydrologic analysis are assumed to enter the drainage inlets located in bioretention areas after volume capture has been achieved and flow throughout closed conduits to the site outfall located in the western end of the Aztec Drive extension. The design of the closed conduit drainage system consists of precast reinforced concrete pipe, drop inlet and manholes. The following criteria were used for the design of the majority of closed conduit systems:

- Minimum storm drain pipe diameter of 10 inch;
- Minimum allowable slope to meet a self-cleaning full-pipe flow velocity of 2.0 ft/s;
- Minimum pipe cover of 2 feet, measured from the top of pipe to the roadway or ground surface;
- Pipe material: Reinforced Concrete Pipe (RCP, $n = 0.012$);
- Manholes or drop inlets are placed at intervals of approximately 350 feet on center and at changes in pipe direction or diameter.
- New storm drain system is sized to convey 10-year 24-hour with a free water surface.

The closed conduit drainage system is shown on Figure 1. The results from closed conduit modeling are presented in Appendix B.

5. Summary and Conclusions

The Butte Regional Transit Operations Center Project (project) existing site consists of approximately 10 acres of generally open fallow agricultural fields. Topography is relatively flat with an approximate 0.5% slope from east to west.

The proposed project includes site development to construct a new administration, operation and maintenance buildings, visitor and staff parking lots, bus parking area, and ancillary improvements. Runoff from the buildings, impervious bus parking area, and pervious visitor and staff parking areas is drained toward bioswales and bioretention facilities which are designed to accommodate the overland flow.

The stormwater system is designed to deliver the surface flow to bioswales and biofiltration facilities prior to entering the new storm drain system located in the Aztec Drive extension. Bioretention facilities achieve both water quality and volume capture objectives of the City of Chico, State of California, and will also meet LEED stormwater requirements.

The bioswales and bioretention facilities are located in the median areas and around the perimeter of the site and have suitable access for inspection and maintenance. All drainage into the BMPs is by gravity overland flow and shallow concentrated flow.

The bioretention systems capture 100% of the volume of runoff generated by 2-year 24-hour storm event; therefore no additional treatment is required. Proposed closed conduit system is adequately sized to convey 10-year 24-hour with a free water surface. Bioswales are sized to hydraulically convey the peak flow rate generated by the 100-year 24-hour storm event.

References

Chico Municipal Code (2007), *"Title 18R, Design Criteria and Improvement Standards"*.

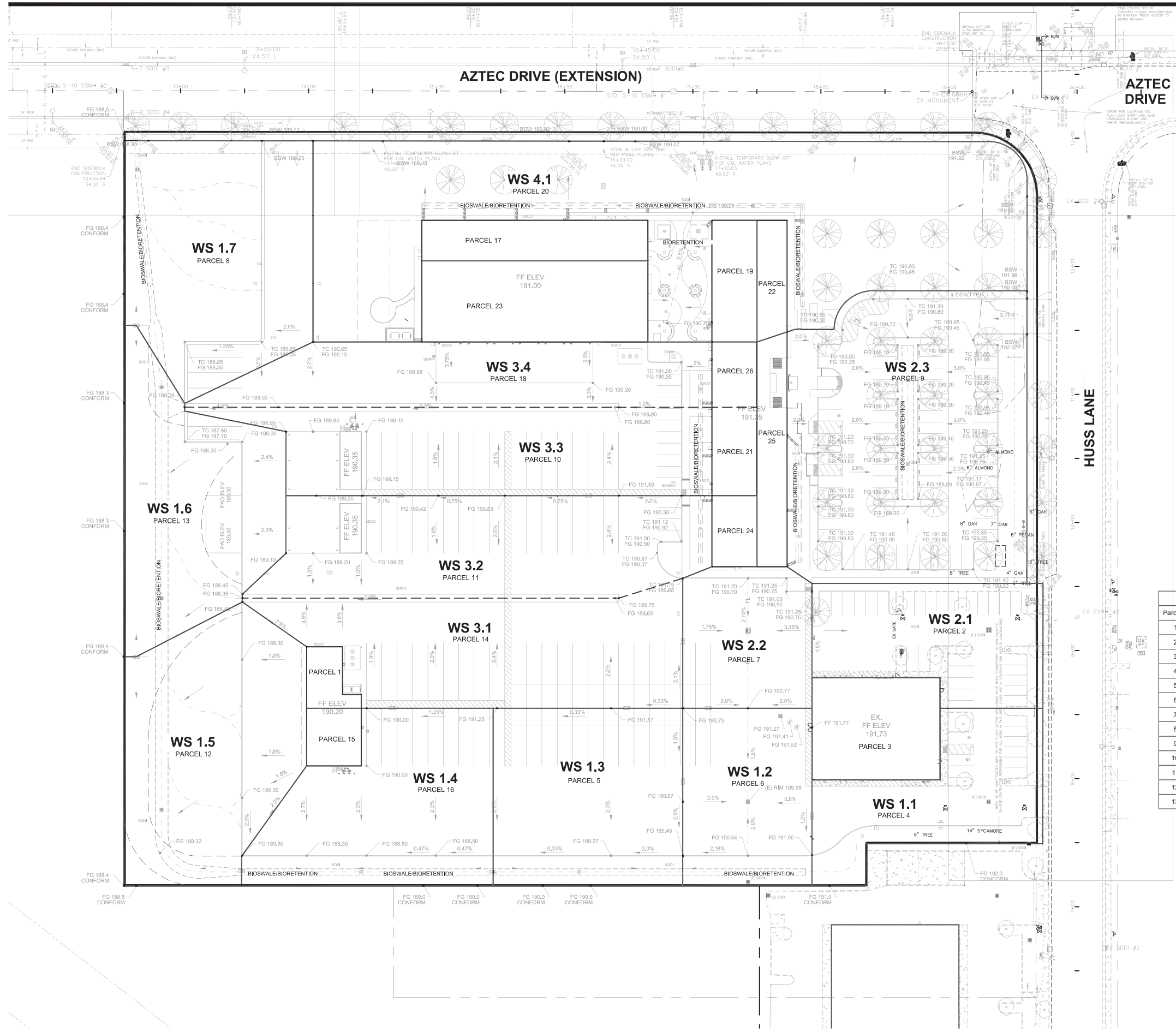
US Green Building Council (2009), *"LEED Reference Guide for Green Building Design and Construction"*.

State Water Resources Control Board (2009), *"National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities"*.

United States Department of Agriculture (1986), *"Technical Release 55 (TR-55) Urban Hydrology for Small Watersheds"*.

National Oceanic and Atmospheric Administration, Atlas 14 (2011), *"Precipitation-Frequency Atlas of the United States, Volume 6 Version 2.0: California"*.

United States Department of Agriculture (2006), *"Soil Survey of Butte Area, California, Parts of Butte and Plumas Counties"*



SHEET GENERAL NOTES:

- IF ANY CULTURAL RESOURCES, INCLUDING BUT NOT LIMITED TO BONES, POTTERY FRAGMENTS OR OTHER POTENTIAL MATERIALS, ARE ENCOUNTERED OR UNEARTHED DURING CONSTRUCTION, CONTRACTOR SHALL IMMEDIATELY CEASE ALL CONSTRUCTION ACTIVITIES WITHIN 100 FEET OF THE DISCOVERED SITE. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND THE BUTTE COUNTY CORNER PURSUANT TO SECTION 7050.5 OF CALIFORNIA'S HEALTH AND SAFETY CODE, AND NOTIFY THE PLANNING SERVICES DEPARTMENT AT (530) 678-9800.
- CONTRACTOR SHALL COORDINATE THE PHASE 2 SITE IMPROVEMENTS WORK AFTER SUBSTANTIAL COMPLETION OF THE PHASE 1 SITE IMPROVEMENTS AND ONCE THE OWNER HAS MOVED ALL EXISTING OPERATIONS TO THE NEW FACILITIES.

LEGEND

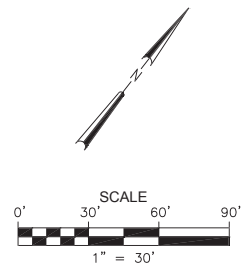
- SITE LIMITS
- EXISTING CONTOUR
- FLOW LINE
- GRADE BREAK
- GRADE SLOPE WITH APPROX. SLOPE PERCENTAGE
- SPOT ELEVATION
- PHASE 2 WORK LIMITS

ABBREVIATIONS

- FG FINISH GRADE
- FL FLOW LINE
- GB GRADE BREAK
- TC TOP OF CURB

LOCATION OF EXISTING UTILITIES AND STRUCTURES ARE FROM THE BEST INFORMATION AVAILABLE. EXACT LOCATION AND COMPLETENESS ARE NOT GUARANTEED. CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICES ALERT (800) 227-2600 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION AND POTHOLE FOR EXACT LOCATION.

Parcel Area Table			Parcel Area Table		
Parcel #	Paved area (sq.ft.)	Unpaved area (sq.ft.)	Parcel #	Paved area (sq.ft.)	Unpaved area (sq.ft.)
1	1,502	-	14	25,168	-
2	12,385	2,790	15	1,920	-
3	8,008	-	16	16,688	4,587
4	5,246	9,605	17	5,590	-
5	17,065	3,495	18	18,090	500
6	11,605	2,407	19	3,344	-
7	10,651	270	20	51,730	6,945
8	8,685	17,463	21	2,428	-
9	29,345	12,010	22	2,139	-
10	22,918	900	23	11,178	-
11	25,435	980	24	1,953	-
12	18,295	7,355	25	4,211	-
13	4,775	16,955	26	1,795	-



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Butte Regional Transit Operations Center
 326 HUSS DRIVE
 CHICO, CA 95928

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

PROJECT NUMBER: 11054.03
 DATE: 4-18-14
 DRAWN BY: CB
 CHECKED BY: MK
 REVISIONS:

POST-DEVELOPED SITE CONDITION

Figure 1

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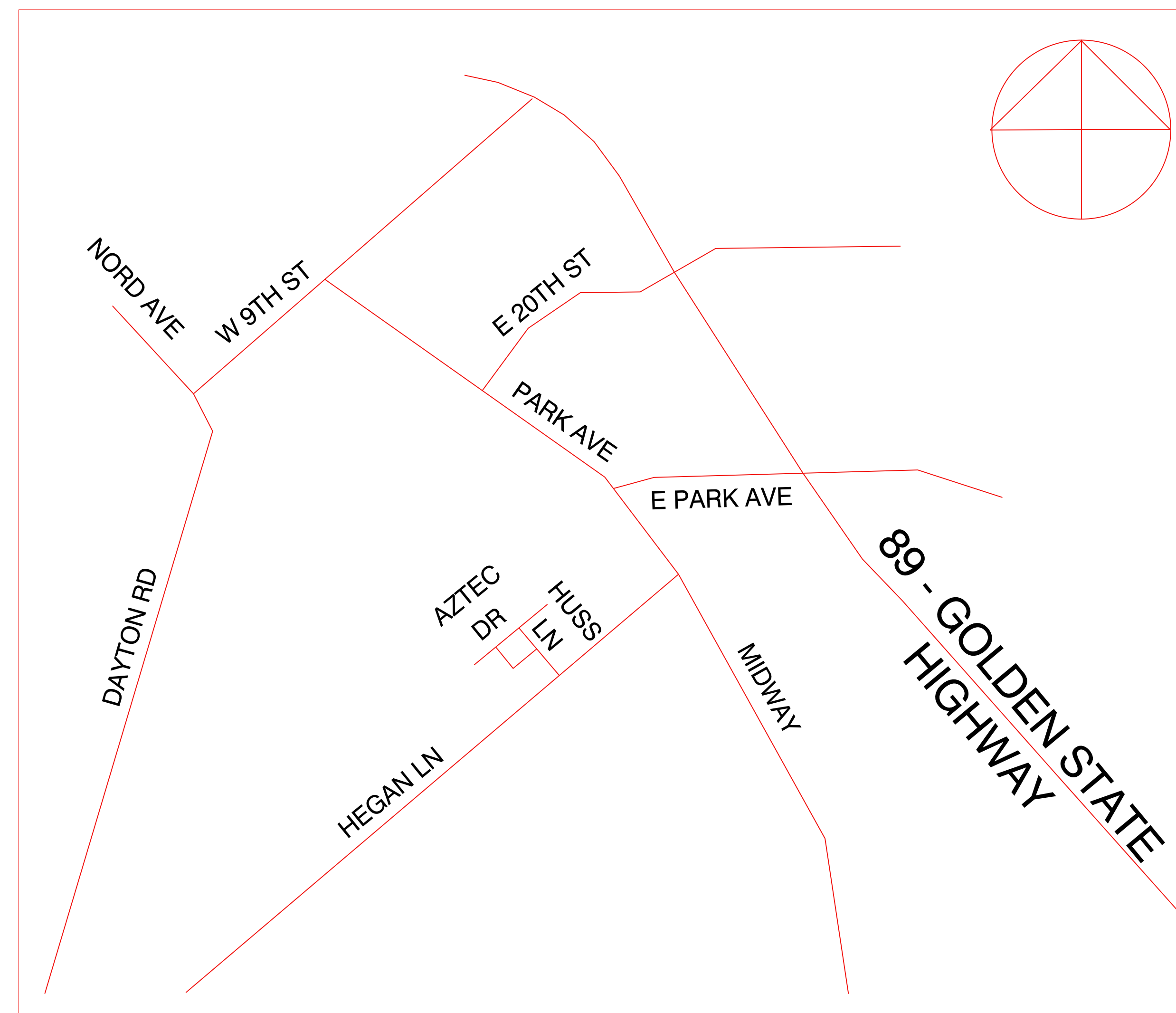
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Appendices

BUTTE COUNTY ASSOCIATION OF GOVERNMENTS

WATER POLLUTION CONTROL DRAWINGS (WPCDs) BUTTE REGIONAL TRANSIT OPERATIONS CENTER

326 HUSS DRIVE, CHICO, CA 95928



LOCATION MAP
NOT TO SCALE

TLCD
ARCHITECTURE

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CHICO, CA 95928





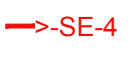

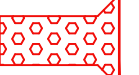
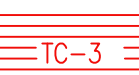
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4-18-14
DRAWN BY:
CB
CHECKED BY:
MK
REVISIONS:



**WATER POLLUTION
CONTROL PLAN
WP-100**

BEST MANAGEMENT PRACTICES (BMPs) SYMBOLS & LEGEND

NOTE THAT NOT ALL SYMBOLS ARE USED ON WPCDs, ALL LISTED BMPs MAY BE USED FOR PROJECT

	EC-1	SCHEDULING
	EC-9	EARTH DIKE AND DRAINAGE SWALES
	SC-6	INLET PROTECTION
	SE-1	SILT FENCE
	SE-4	CHECK DAMS
	SE-5	FIBER ROLLS
	TC-1	STABILIZED CONSTRUCTION ENTRANCE AND EXIT
	TC-3	ENTRANCE OUTLET TIRE WASH

GENERAL LEGEND

	STORMWATER SAMPLING LOCATION & IDENTIFICATION
	WATERCOURSE OR STORMWATER FLOW DIRECTION

1. REFER TO SWPPP DOCUMENTATION, APPENDICES, & ATTACHMENTS FOR ADDITIONAL NPDES/SWPPP RELATED INFORMATION.
2. INSTALL ALL BMP MATERIALS, STRUCTURES, AND PRODUCTS PER MANUFACTURERS' INSTALLATION REQUIREMENTS.
3. PRESERVE ALL EXISTING VEGETATION TO THE MAXIMUM EXTENT PRACTICAL. ONLY DISTURB AREAS NECESSARY TO COMPLETE CONSTRUCTION.
4. REMOVE ALL EXISTING DEBRIS, TRASH, ETC. PRIOR TO PLACEMENT OF STRAW MULCH AND AT THE END OF EACH DAY. AFTER CONSTRUCTION COMPLETION, ALL BMPs INSTALLED, OR INTRODUCED MATERIALS, SHALL BE REMOVED AND DISPOSED OF OFFSITE UNLESS THEY ARE THE POST-CONSTRUCTION (FINAL) BMPs.
5. AS APPROPRIATE, TEMPORARY EROSION & SEDIMENT CONTROL BMPs SHALL BE INSTALLED AT LEAST 48 HOURS PRIOR TO A PREDICTED PRECIPITATION EVENT (50% OR GREATER PROBABILITY PER NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA). ADEQUATE SUPPLIES OF BMP MATERIALS SHALL BE AVAILABLE AND ON-SITE.
6. IDENTIFIED FAILURES OR OTHER SHORTCOMINGS REQUIRING REPAIR, MODIFICATION, OR UPGRADING OF BMPs SHALL BEGIN WITHIN 72 HOURS OF BEING IDENTIFIED, AND SHALL BE COMPLETED AS SOON AS PRACTICAL.
7. INSPECTIONS – REFER TO SWPPP FOR TRAINING, CERTIFICATION, INSPECTION, SAMPLING, AND RECORDING REQUIREMENTS.
 - 7.1. DAILY – BY CONTRACTOR OR QSP/QSD.
 - 7.1.1. ALL IMMEDIATE ACCESS ROADS.
 - 7.1.2. ENTIRE CONSTRUCTION SITE FOR WASTE MANAGEMENT AND NON-STORMWATER ISSUES (GOOD HOUSEKEEPING).
 - 7.2. WEEKLY – BY QSP/QSD OR QSP/QSD TRAINED PERSONNEL.
 - 7.2.1. ALL BMPs FOR CORRECT INSTALLATION AND OPERATION.
 - 7.3. QUARTERLY (Jan-Mar, Apr-Jun, Jul-Sept, Oct-Sept) – BY QSP/QSD.
 - 7.3.1. EACH DRAINAGE AREA WITHIN CONSTRUCTION SITE FOR PRESENCE OR INDICATIONS OF NON-STORM WATER DISCHARGES.
- 7.4. NON-VISIBLE POLLUTANTS – BY CONTRACTOR OR QSP/QSD
 - 7.4.1. IF ANY BREACH, MALFUNCTION, LEAKAGE, OR SPILL WHICH COULD RESULT IN POLLUTANT DISCHARGE IS OBSERVED DURING ANY INSPECTION, ADDITIONAL INSPECTION AND SAMPLING SHALL BE CONDUCTED FOR ALL NON-VISIBLE POLLUTANT PARAMETERS AS DESCRIBED IN THE SWPPP.
- 7.5. PRECIPITATION (STORM) EVENT INSPECTIONS – BMP INSPECTION FOR POSSIBLE MAINTENANCE NEEDS BY CONTRACTOR, STORMWATER INSPECTION & SAMPLING BY QSP/QSD.
 - 7.5.1. WITHIN 48 HOURS PRIOR TO QUALIFYING RAIN EVENT.
 - 7.5.2. EACH 24 HOURS DURING EXTENDED PRECIPITATION EVENTS.
 - 7.5.3. WITHIN 48 HOURS AFTER EACH QUALIFYING RAIN EVENT.
 - 7.5.4. INSPECTIONS TO OCCUR DURING BUSINESS HOURS ONLY.
 - 7.5.5. INSPECTIONS SHALL NOT OCCUR DURING POTENTIALLY HAZARDOUS ACCESS OR WEATHER CONDITIONS.
8. FINAL or POST-CONSTRUCTION BMPs – AREAS WILL BE CONSIDERED COMPLETE WHEN THE FINAL BMPs ARE INSTALLED AND VERIFIED BY THE QSP OR QSD. FINAL BMPs WILL GENERALLY CONSIST OF:
 - 8.1. ALL OTHER EXPOSED OR DISTURBED SOILS – ESTABLISH VEGETATIVE COVER. ESTABLISHED VEGETATION IS DEFINED BY VISUALLY ESTABLISHING THAT THERE IS AT LEAST 70% VEGETATED COVER ON THE ENTIRE DISTURBED AREA. CONTRACTOR MAY CONSIDER STRIPPING TOPSOILS AND STOCKPILING FOR LATER DISTRIBUTION OVER DISTURBED AREAS TO AID IN RAPID REGROWTH OF THE NATURALIZED VEGETATION. DURING DRY WEATHER CONDITIONS, CONTRACTOR MAY NEED TO CONSIDER IRRIGATION IN CONJUNCTION WITH DUST CONTROL WATERING TO RAPIDLY ESTABLISH VEGETATION. SEED, THEN STRAW COVER, IS TYPICALLY APPROPRIATE FOR SMALL AREAS. HYDROSEEDING IS TYPICALLY APPROPRIATE FOR LARGE AREAS, AND TO PROVIDE LONGER LASTING PROTECTION FOR SEEDS. GIVEN THE NATURE OF THIS PROJECT, QSD/QSP WILL ACCEPT VIRTUALLY ANY COMBINATION OF BMPs TO ESTABLISH THE VEGETATIVE COVER THAT IS PROPOSED BY THE CONTRACTOR.



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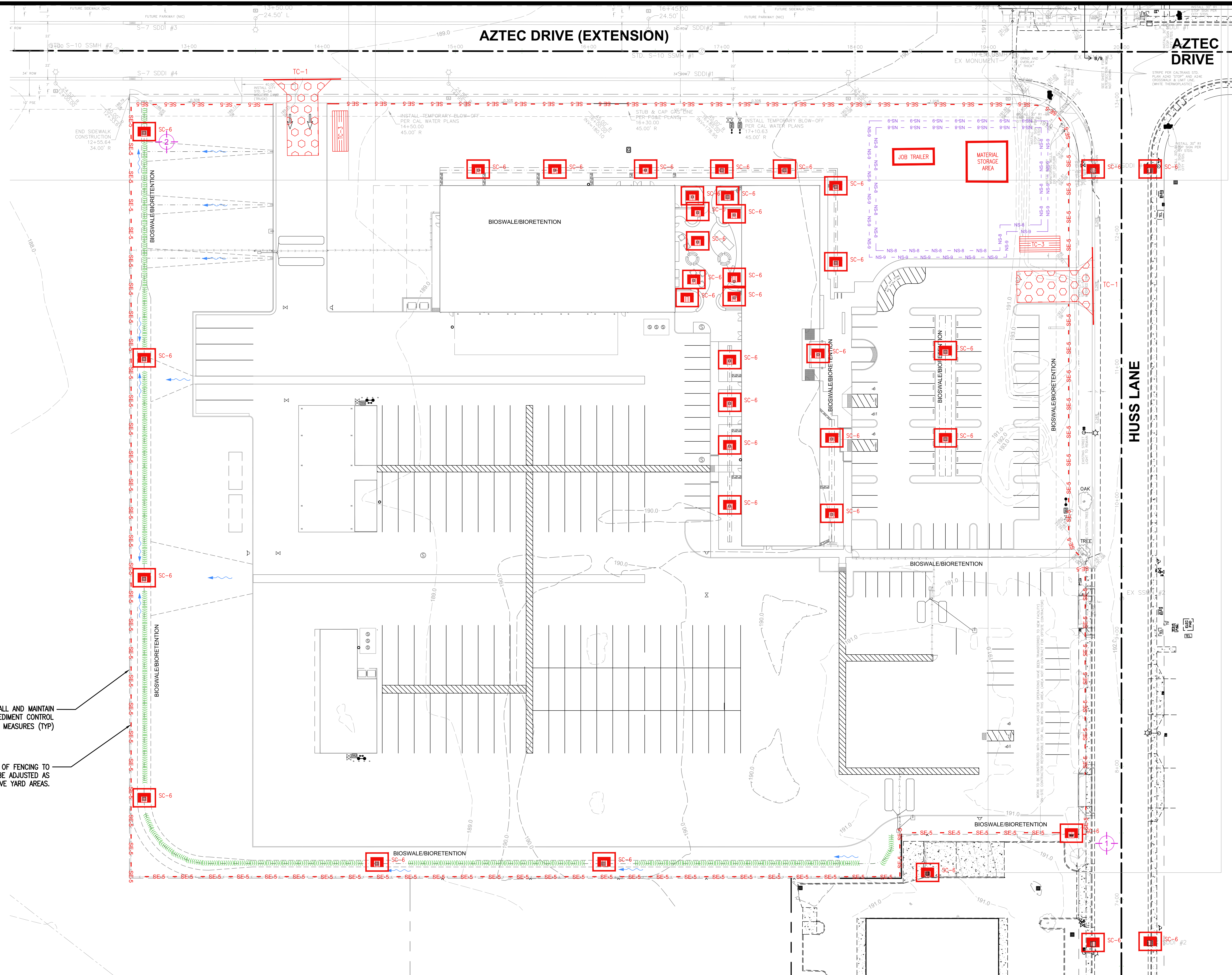
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REVISIONS:

**WATER POLLUTION
CONTROL PLAN
WP-101**



SITE FENCING: AS NEEDED INSTALL AND MAINTAIN PERIMETER EROSION AND SEDIMENT CONTROL MEASURES (TYP)

SE-05 FIBER ROLLS. PLACE ALONG INSIDE OF FENCING TO PROVIDE PERIMETER PROTECTION. MAY BE ADJUSTED AS NECESSARY BUT SHALL SURROUND ALL ACTIVE YARD AREAS.

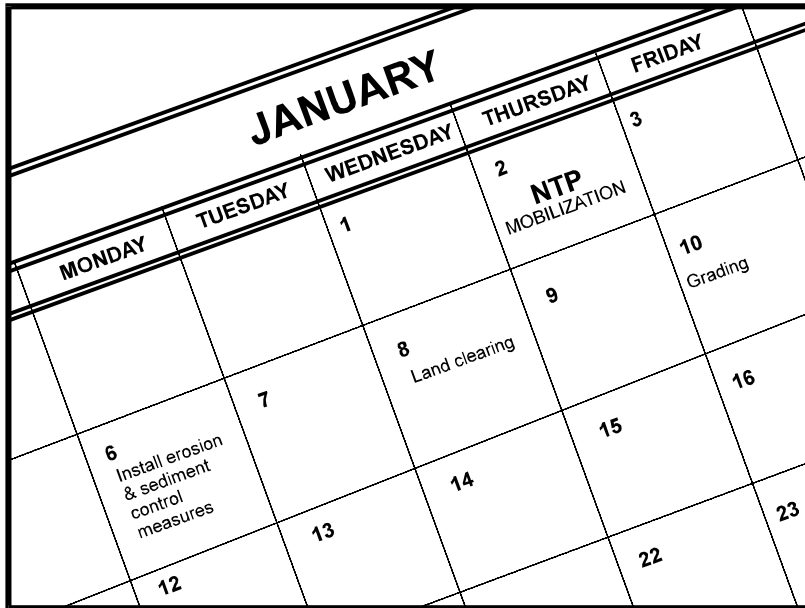
SHEET NOTES

1. REFER TO SHEET WP101 FOR SWPPP SYMBOLS & LEGEND. CONTRACTOR SHALL BE FAMILIAR WITH ALL GENERAL NOTES INCLUDED ON SHEET WP101.
2. ENVIRONMENTAL COMPLIANCE BMPs SUPERCEDE ALL SWPPP BMPs. CONTRACTOR SHALL BE FAMILIAR WITH PROJECT ENVIRONMENTAL COMPLIANCE REQUIREMENTS INCLUDING WATER QUALITY, WETLANDS, FISHERIES, AND CALIFORNIA TIGER SALAMANDER.
3. FINAL LOCATION OF FILTER FENCE, FIBER ROLLS, OR OTHER PERIMETER CONTROL BMPs MAY BE FIELD ADJUSTED OR AUGMENTED AS NECESSARY TO CONFORM TO TOPOGRAPHY AND SITE CONDITIONS, AS APPROVED BY THE QSP OR QSD.
4. FIBER ROLLS SHALL BE USED FOR PERIMETER EROSION AND SEDIMENT CONTROL. REFER TO (BMP SE-5) FOR PROJECT SPECIFIC DETAILS FOR FIBER ROLL APPLICATIONS.
5. CONTRACTOR SHALL PROVIDE STREET STORM DRAINAGE INLET PROTECTION AS NECESSARY TO PREVENT ANY TRACKED MATERIALS FROM ENTERING STORM DRAINAGE SYSTEM ALONG PUBLIC OR PRIVATE ROADS USED FOR PROJECT ACCESS. POTENTIALLY AFFECTED INLETS MAY BE OUT OF THE RIGHT OF WAY, AND/OR NOT SHOWN HEREON.
6. IF STREET SWEEPING IS REQUIRED, VACUUM UNITS SHALL BE USED. DO NOT WASH WATER INTO STORMDRAIN SYSTEM.
7. ACCESS TO PROJECT SITE SHALL BE RESTRICTED TO ENSURE ALL VEHICLE TRAFFIC USES APPROVED CONSTRUCTION ENTRANCES AND EXITS.
8. STABILIZED ROCK CONSTRUCTION ENTRANCES AND EXITS CAN BE REPLACED WITH RUMBLE STRIPS OR ACCEPTABLE ALTERNATE WITH PRIOR APPROVAL FROM QSP OR QSD.
9. ALL NON-STORMWATER (NS) AND WASTE MANAGEMENT (WM) BEST MANAGEMENT PRACTICES APPLY AT ALL TIMES TO CONSTRUCTION ACTIVITIES. REFER TO PROJECT SWPPP MANUAL FOR ADDITIONAL INFORMATION. LOCATION OF NS AND WM BMPs ARE TYPICALLY NOT SHOWN ON WPCDs DUE TO THE DYNAMIC NATURE OF THIS PROJECT.
10. DUST CONTROL MEASURES SHALL BE IMPLEMENTED AT ALL TIMES AS NECESSARY TO PREVENT WIND-BORNE EROSION AND DUST POLLUTION.

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***APPENDIX H: STORM WATER BMP HANDBOOK-
CONSTRUCTION FACT SHEETS***



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

Objectives

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



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

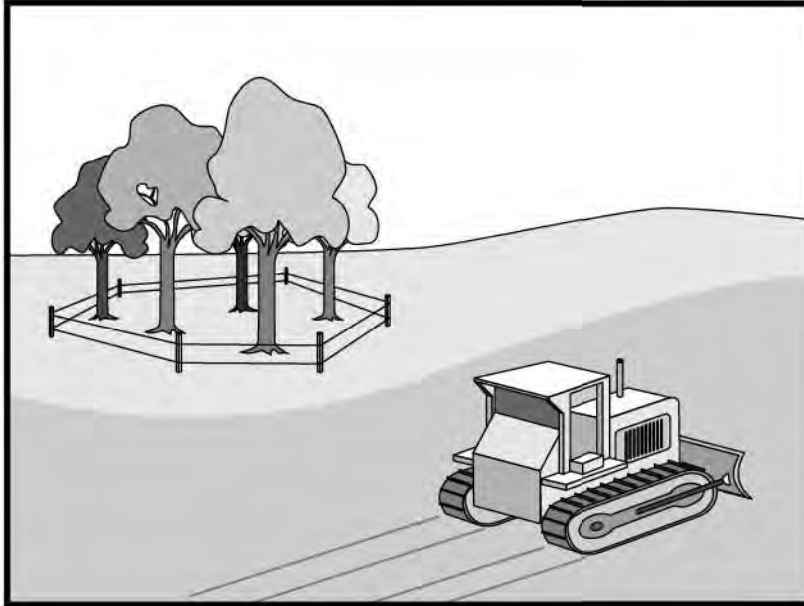
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

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



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.

Objectives

EC	Erosion Control	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



EC-2 Preservation Of Existing Vegetation

Limitations

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

Implementation

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

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

Timing

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

Design and Layout

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

Preservation Of Existing Vegetation EC-2

Costs

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

Inspection and Maintenance

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

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

EC-2 Preservation Of Existing Vegetation

- 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.

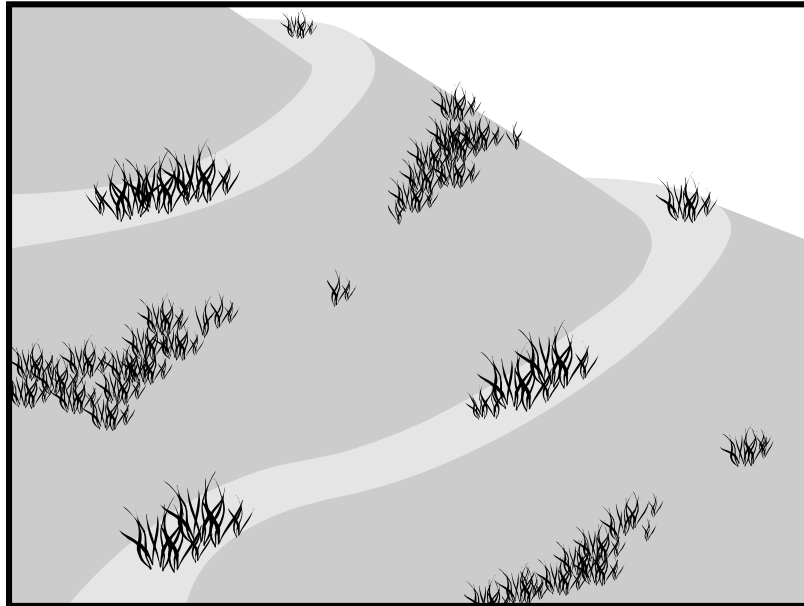
References

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.



Description and Purpose

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

Suitable Applications

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

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Category**
- Secondary Category**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization



Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
 - Straw mulch (see Straw Mulch EC-6)
 - Rolled erosion control products (see Geotextiles and Mats EC-7)
 - Application of Compost Blanket (see Compost Blanket EC-14)

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

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

Implementation

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

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

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

The following steps should be followed for implementation:

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

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
 - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
 - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

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

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

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

Inspection and Maintenance

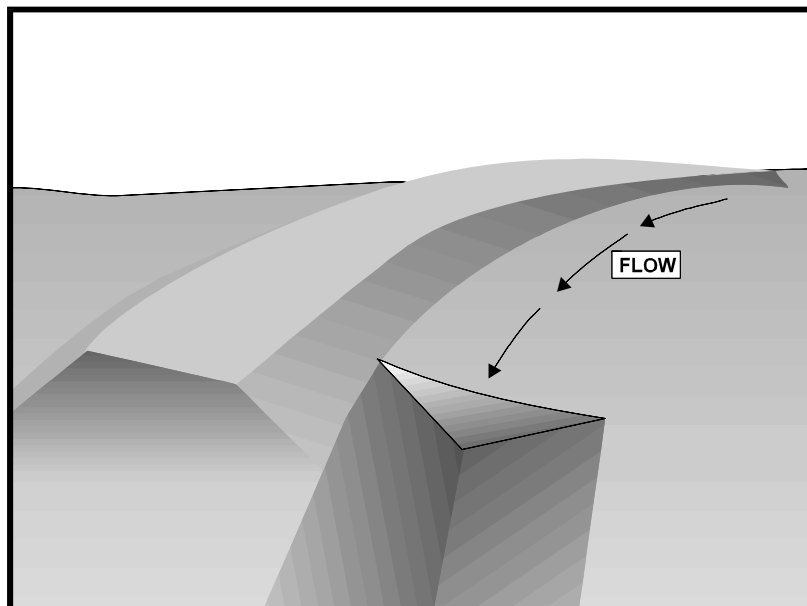
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where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

References

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

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

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



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

Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



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

Limitations

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

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

Implementation

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

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

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

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

General

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

Earth Dikes

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

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

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

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

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

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

Drainage Swales

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

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

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

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

Costs

- Cost ranges from \$15 to \$55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: \$2.50 - \$6.50/linear ft; Large dikes: \$2.50/yd³.
- 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.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

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

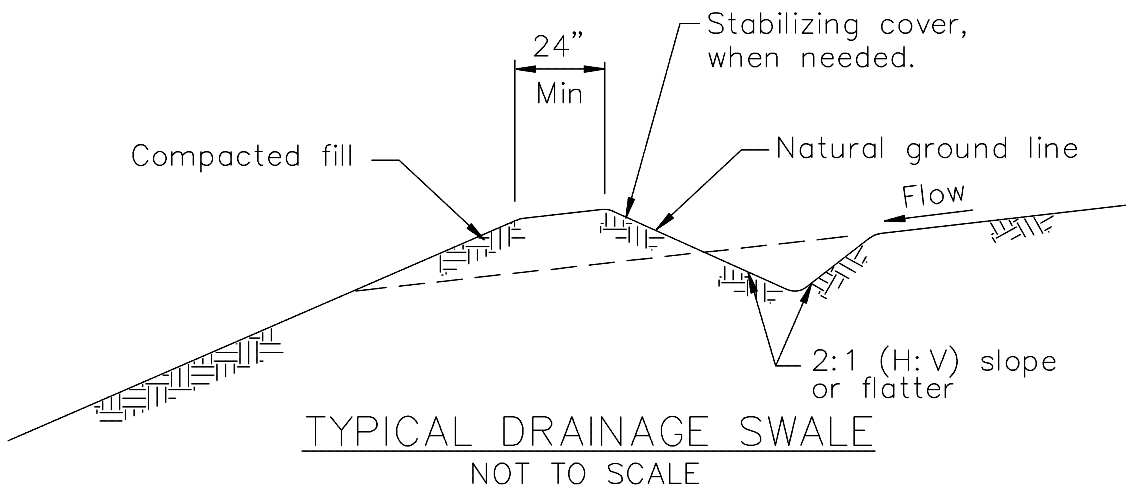
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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

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

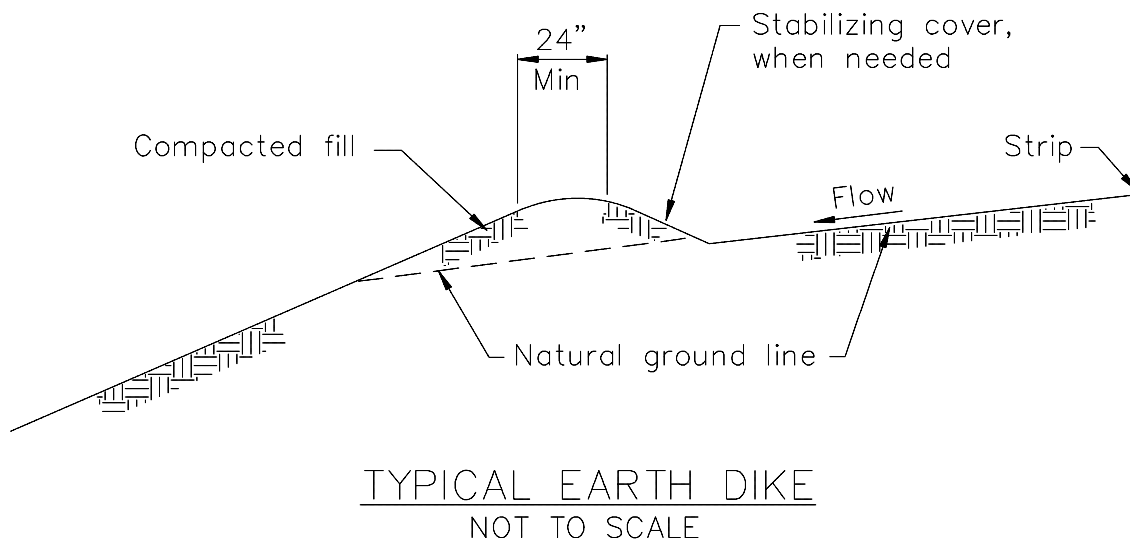
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

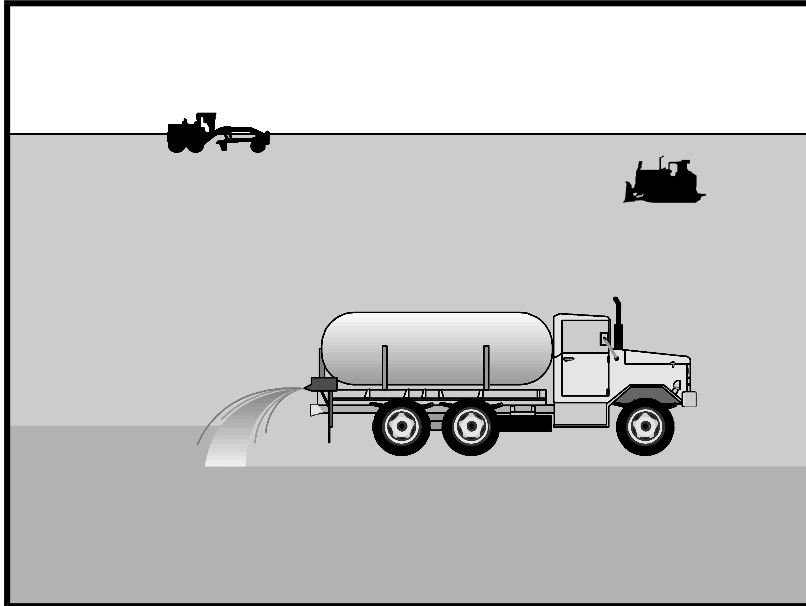
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



NOTES:

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





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.

Objectives

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	<input checked="" type="checkbox"/>
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



- 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

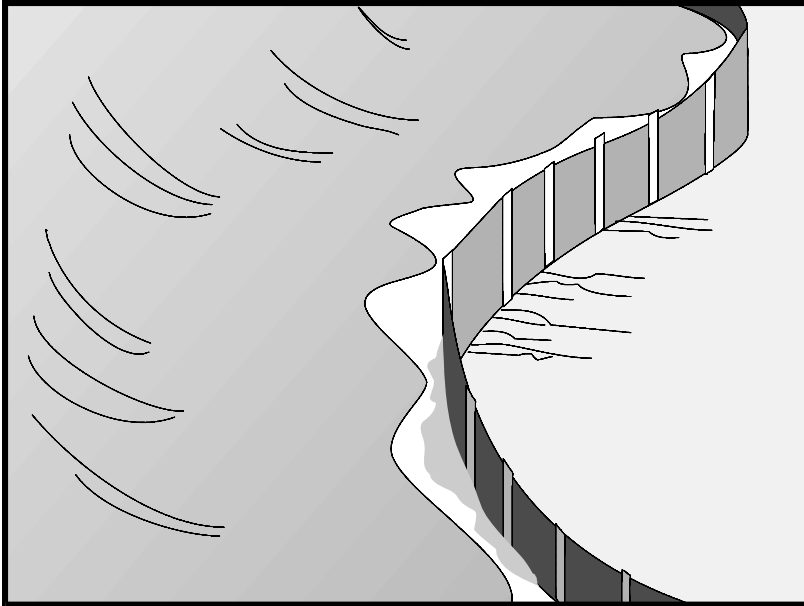
Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

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.



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.

Objectives

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
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



- 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 ft² 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, and 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.

References

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

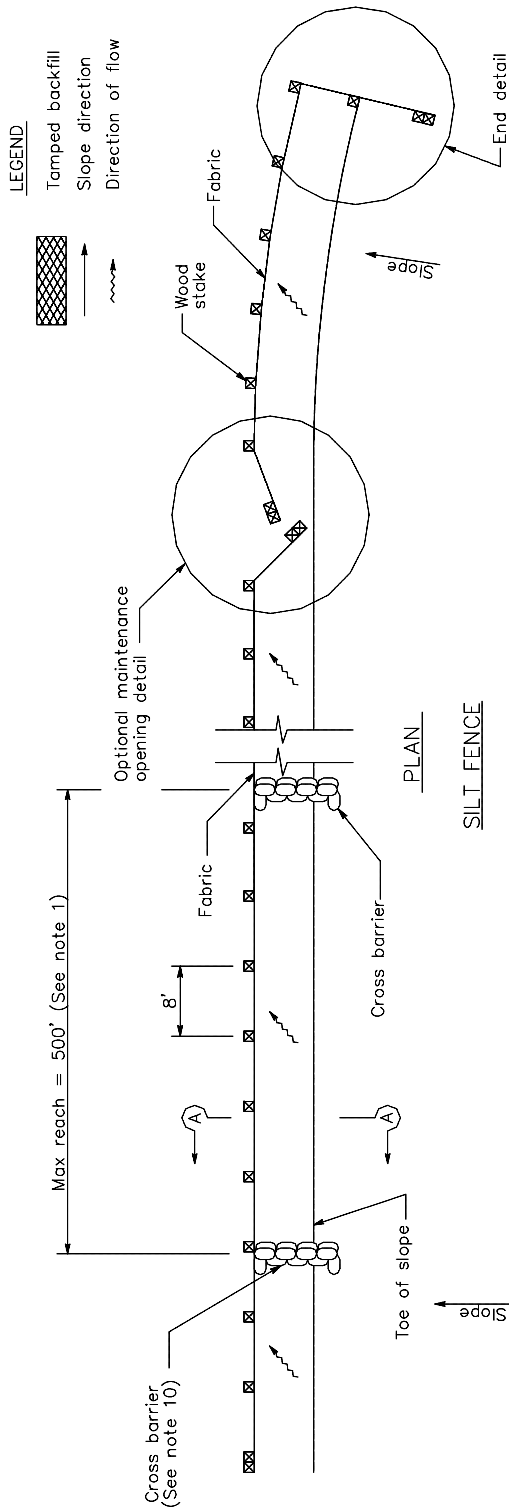
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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

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

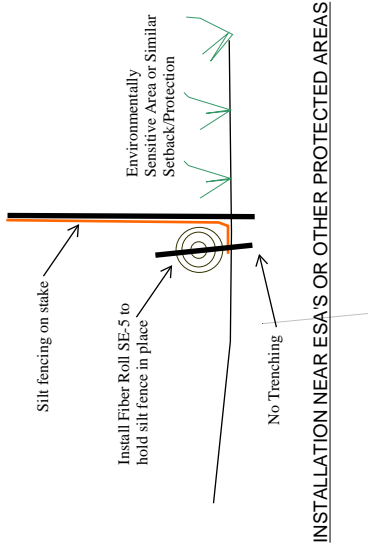
Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

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

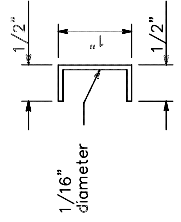


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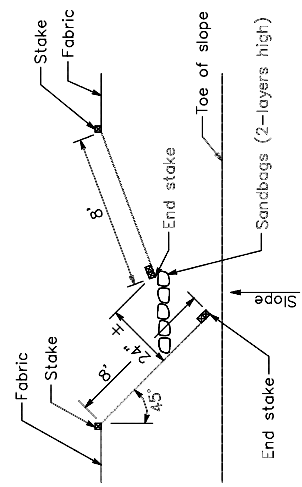
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to 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.



INSTALLATION NEAR ESA'S OR OTHER PROTECTED AREAS



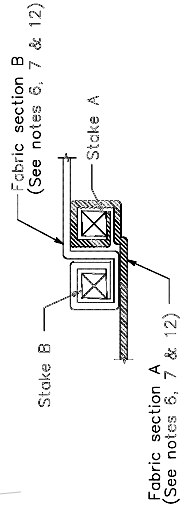
STAPLE DETAIL
(SEE NOTE 9)



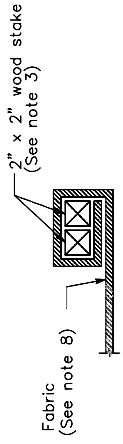
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)

LEGEND

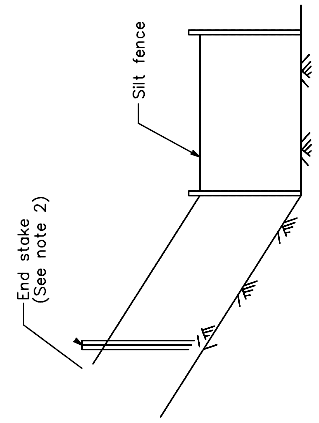
- Tamped backfill
- Slope direction
- Direction of flow



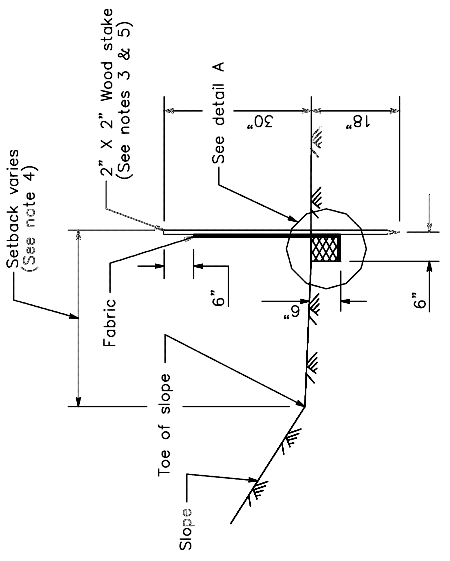
JOINING SECTION DETAIL (TOP VIEW)



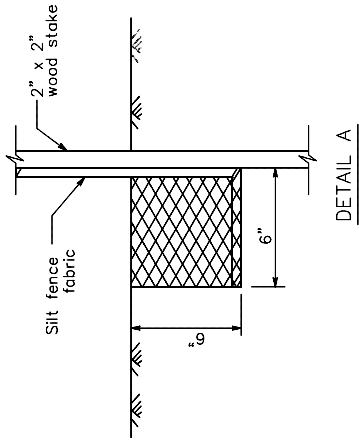
END STAKE DETAIL (TOP VIEW)



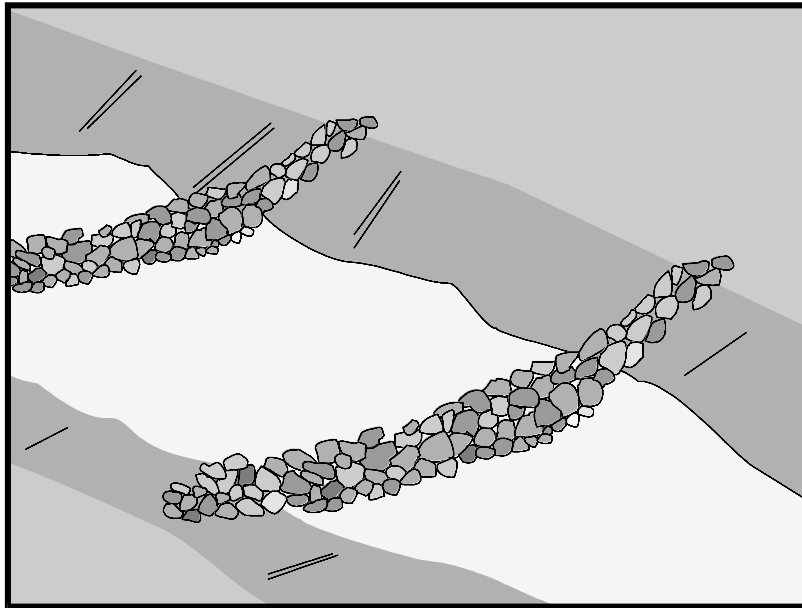
END DETAIL



SECTION A-A



DETAIL A



Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

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

Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Category**
- Secondary Category**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Temporary Silt Dike
- SE-14 Biofilter Bags



Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

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

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

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see “Spacing Between Check Dams” detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of

the ditch or swale (see “Typical Rock Check Dam” detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

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

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see “Gravel Bag Check Dam” detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer’s instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

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

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

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.
- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.
- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.
- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.
- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Upper rows of gravel and sand bags shall overlap joints in lower rows.
- Fiber rolls should be trenched in, backfilled, and firmly staked in place.
- Install along a level contour.
- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

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

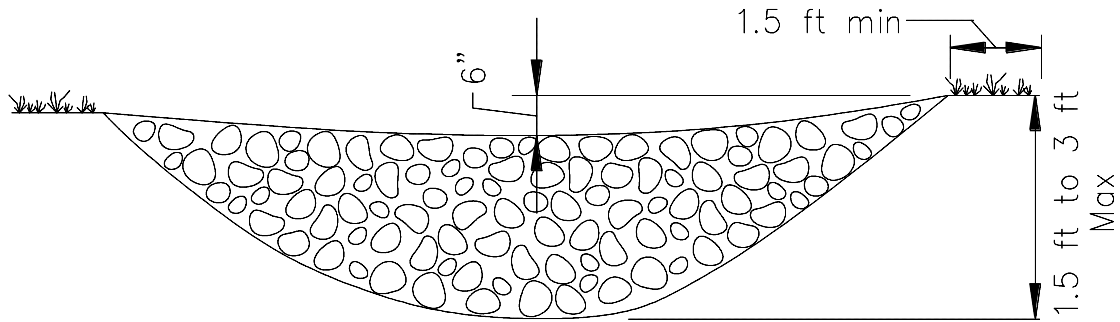
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

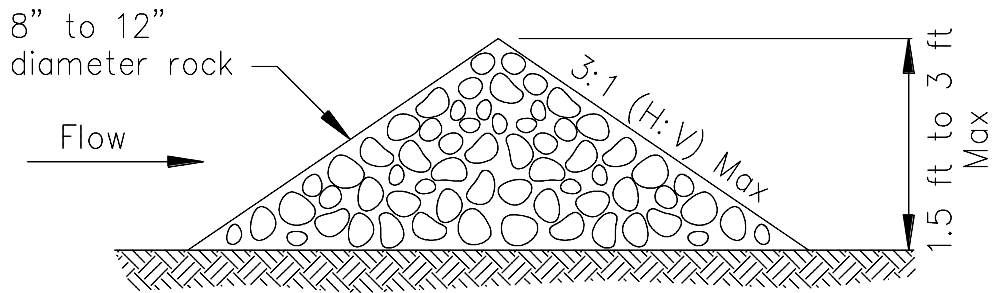
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: <http://anrcatalog.ucdavis.edu/pdf/8125.pdf>

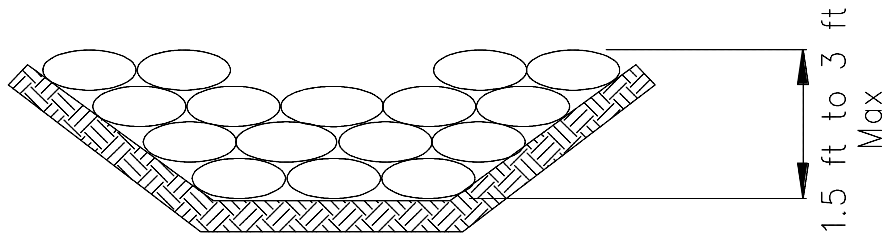


ELEVATION

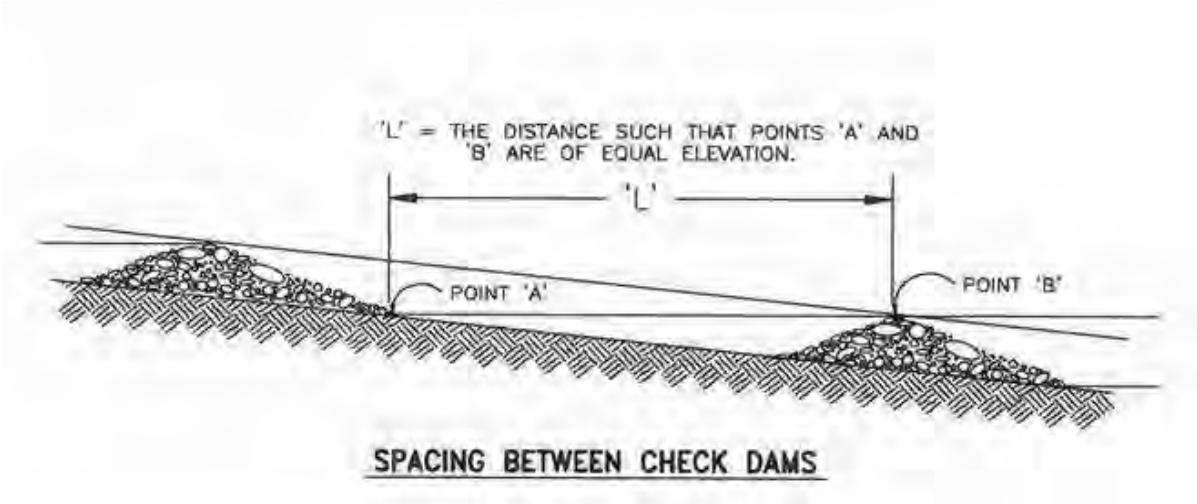


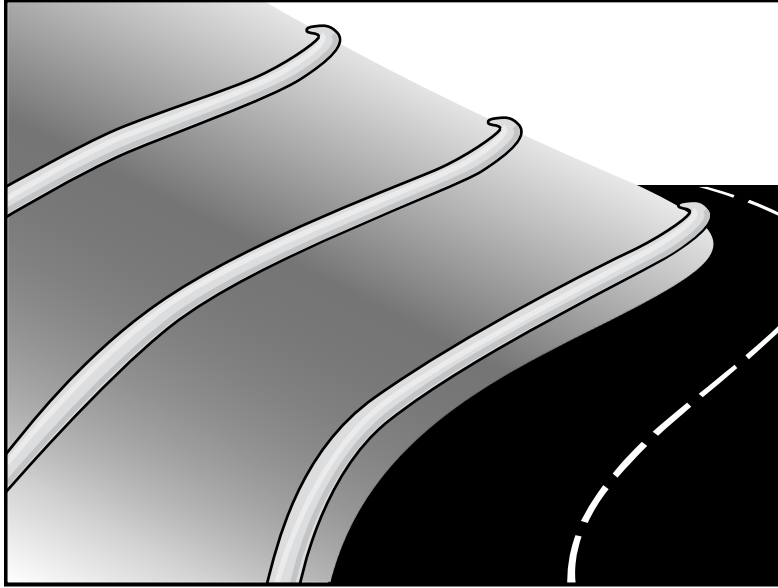
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE





Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Category
- Secondary Category

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Manufactured Linear Sediment Controls
- SE-14 Biofilter Bags

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
 - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
 - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
 - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be $\frac{1}{4}$ to $\frac{1}{3}$ of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
 - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
 - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

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

Material costs for PAM impregnated fiber rolls range between 7.00-\$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

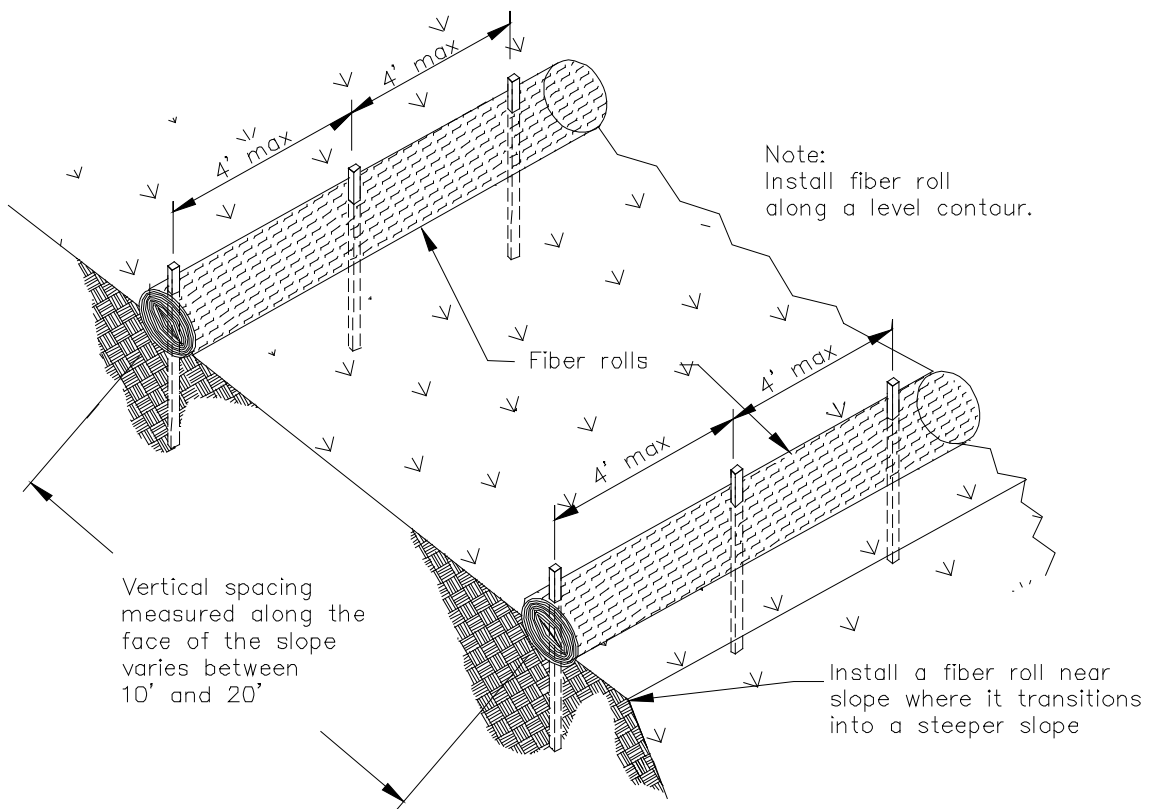
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

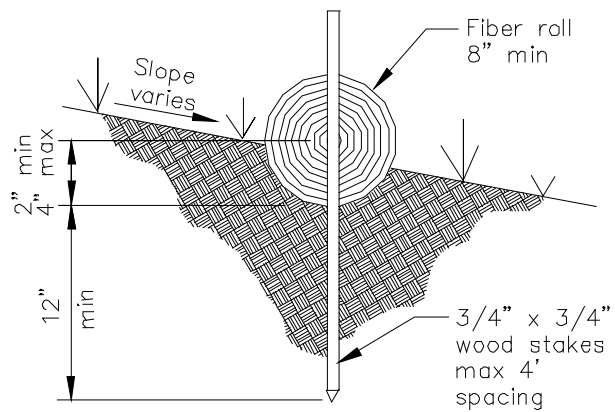
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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



TYPICAL FIBER ROLL INSTALLATION

N.T.S.



ENTRENCHMENT DETAIL

N.T.S.



Description and Purpose

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

Suitable Applications

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

Limitations

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

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

Categories

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd³ hopper) to \$88/hour (9 yd³ 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.

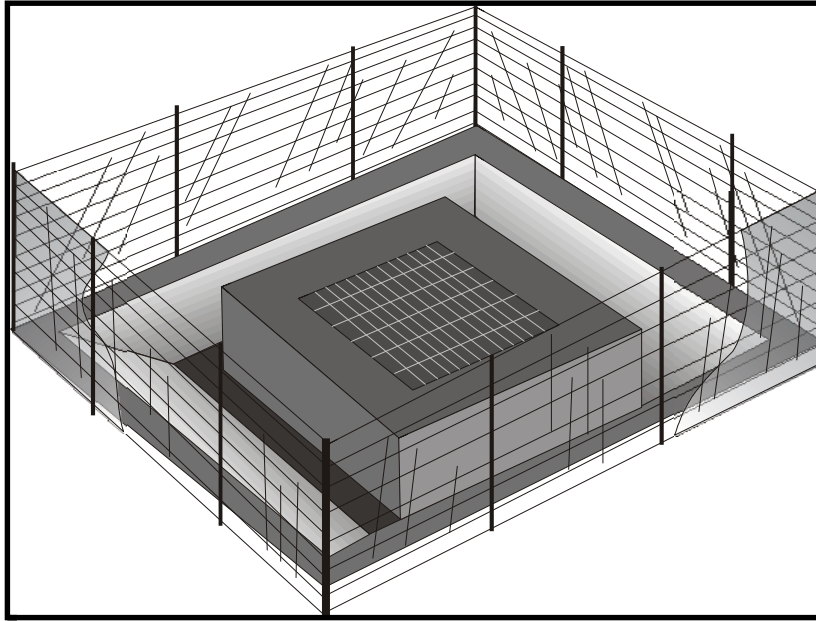
Inspection and Maintenance

- 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.



Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected.

Limitations

- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

Objectives

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-9 Straw Bale Barrier



expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
 - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
 - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
 - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
 - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
 - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
 - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Filter Fabric Fence*** - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
 1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
 2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 48 in.
 3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
 4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
 5. Backfill the trench with gravel or compacted earth all the way around.
- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd³/acre of drainage area.

- **DI Protection Type 3 - Gravel bag** - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.
 1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
 2. Construct on gently sloping street.
 3. Leave room upstream of barrier for water to pond and sediment to settle.
 4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
 5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
- **DI Protection Type 4 – Block and Gravel Filter** - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.
 1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
 2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
 3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
 4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Costs

- Average annual cost for installation and maintenance (one year useful life) is \$200 per inlet.

Inspection and Maintenance

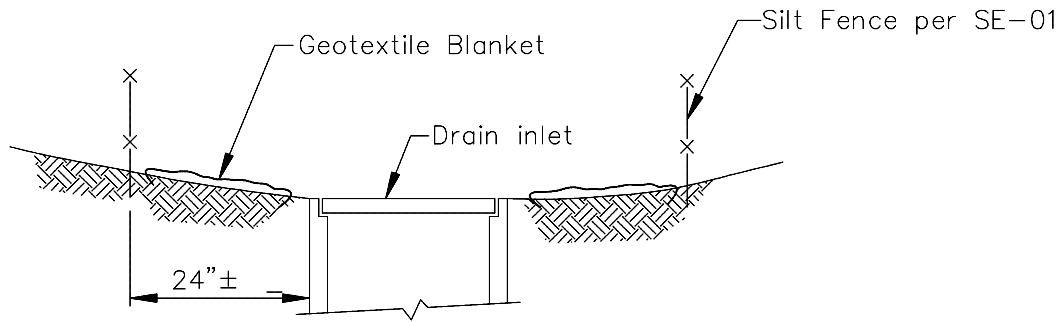
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP 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 storm drain inlet protection once the drainage area is stabilized.
 - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

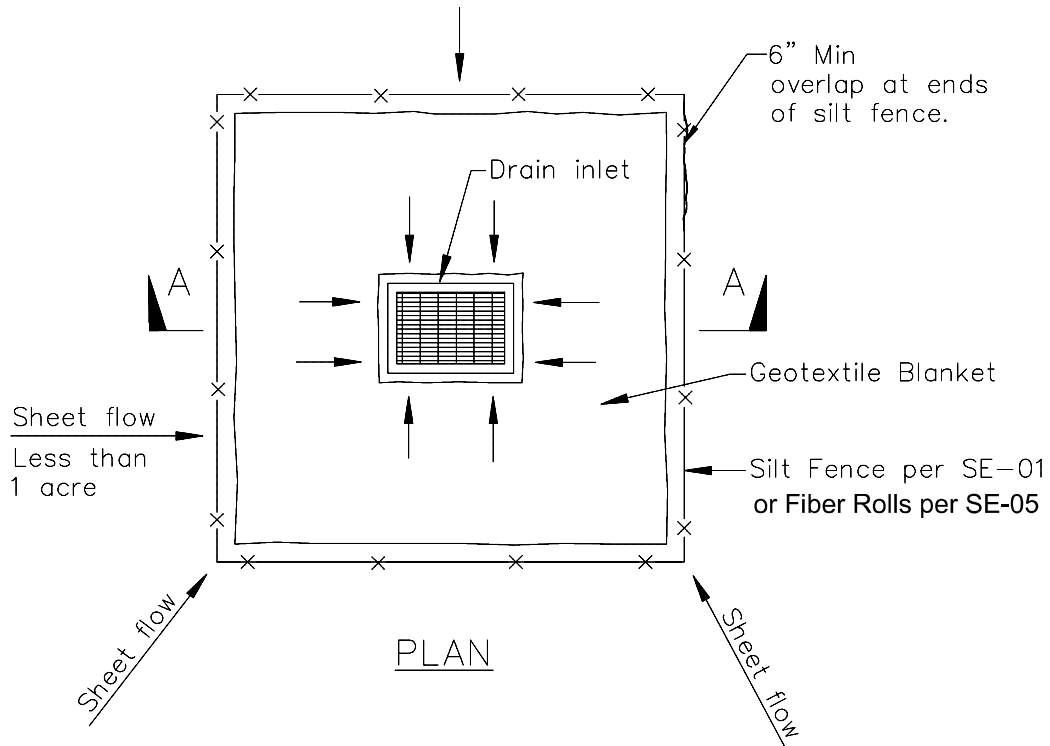
References

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

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



SECTION A-A

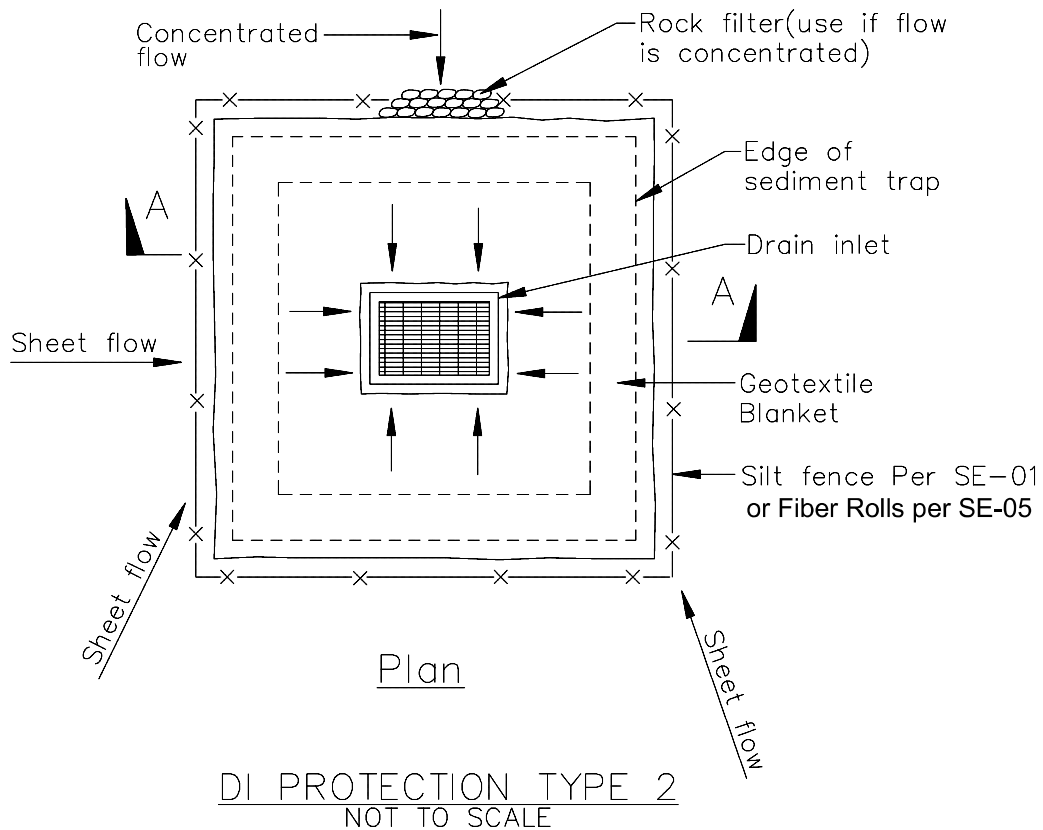
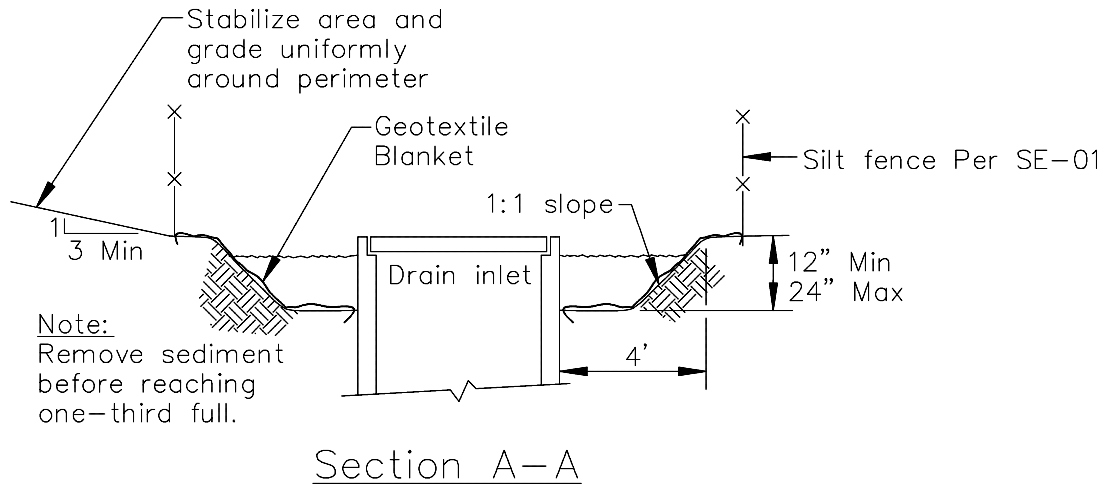


PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

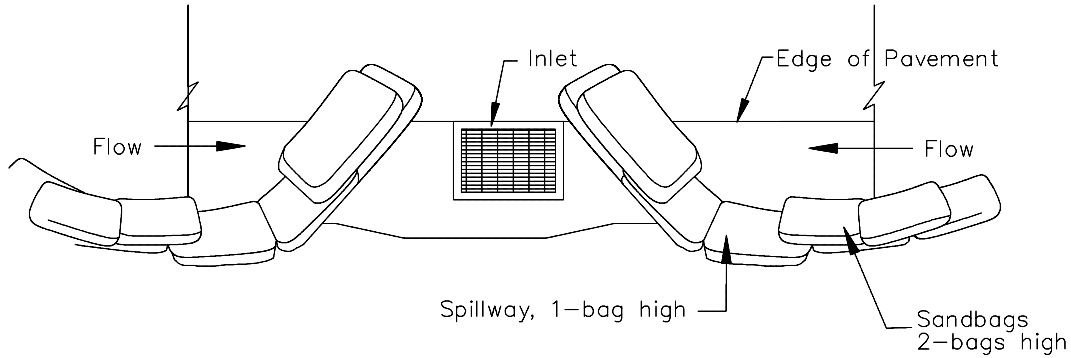
NOTES:

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

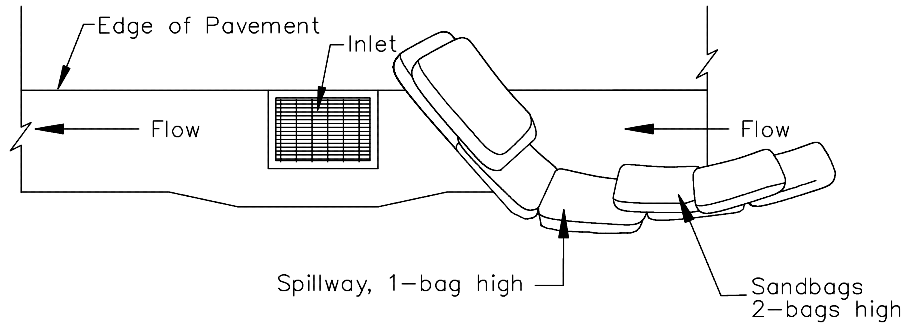


Notes

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



TYPICAL PROTECTION FOR INLET ON SUMP

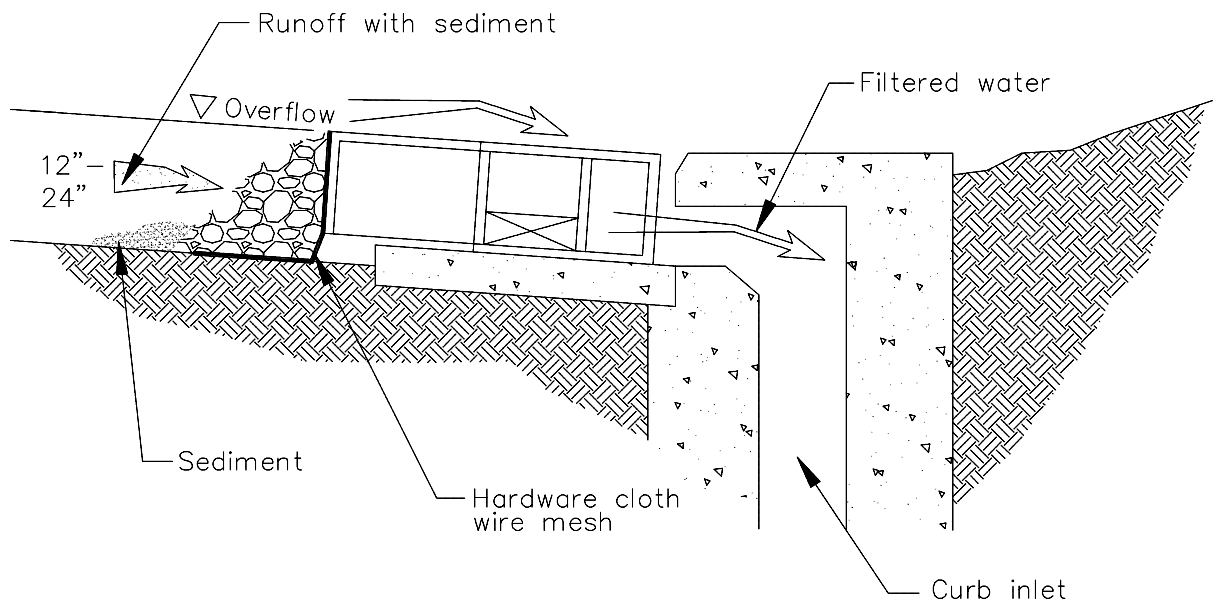
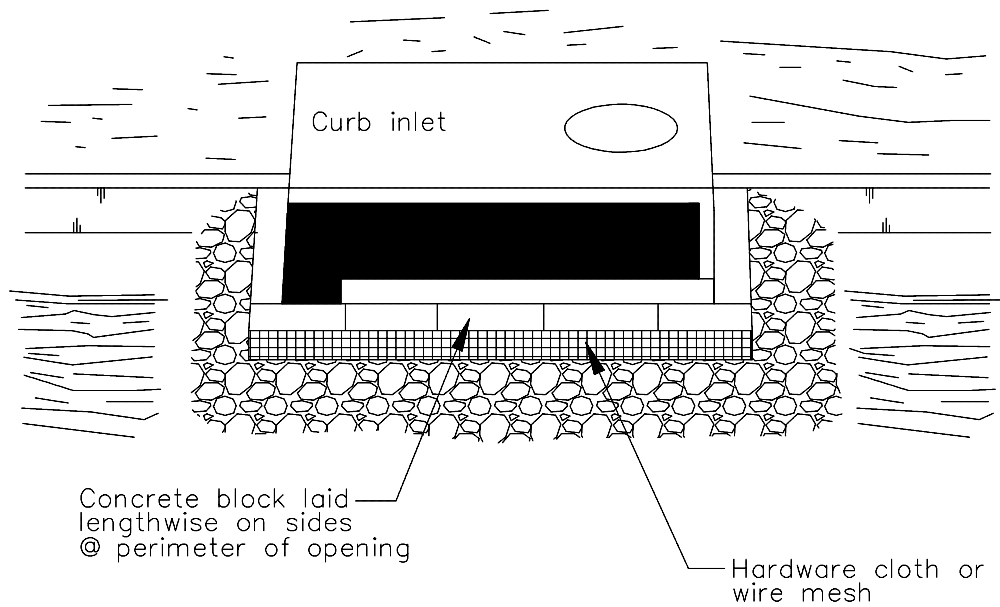


TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

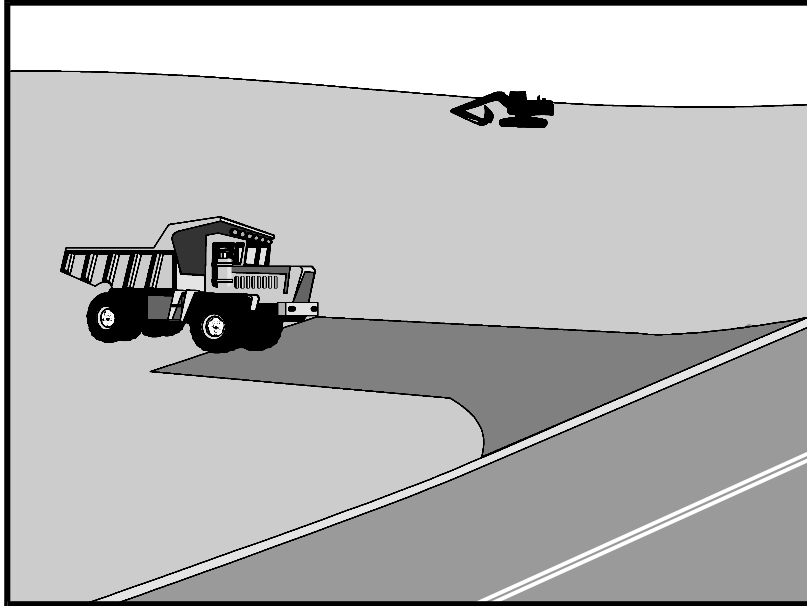
- 1. Intended for short-term use.
- 2. Use to inhibit non-storm water flow.
- 3. Allow for proper maintenance and cleanup.
- 4. Bags must be removed after adjacent operation is completed
- 5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3
NOT TO SCALE



DI PROTECTION — TYPE 4
NOT TO SCALE

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

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.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



Stabilized Construction Entrance/Exit TC-1

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.

Stabilized Construction Entrance/Exit TC-1

- 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.

Stabilized Construction Entrance/Exit TC-1

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

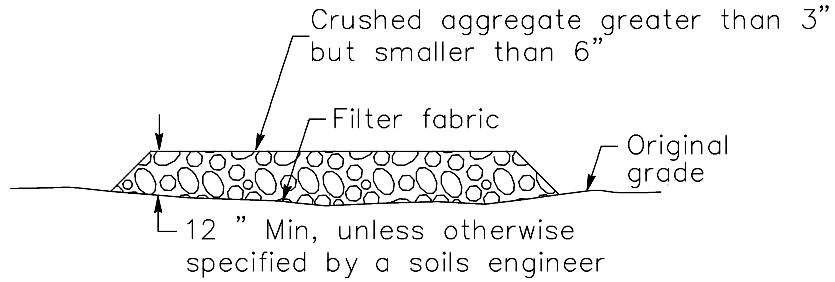
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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

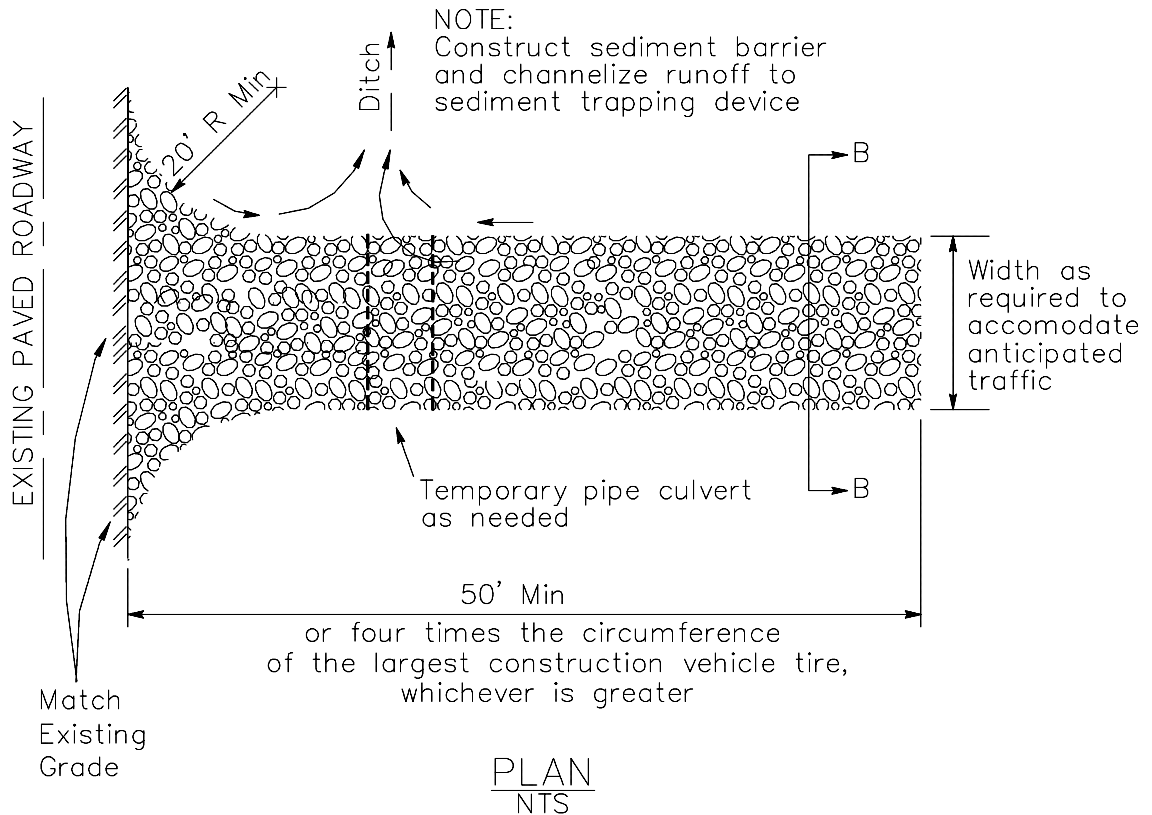
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

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

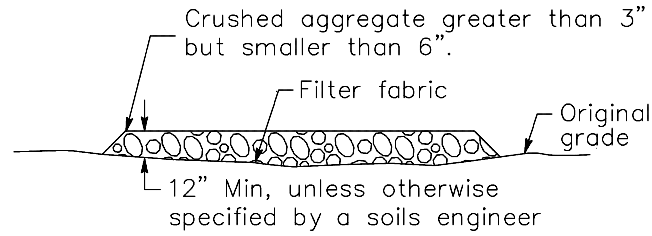
Stabilized Construction Entrance/Exit TC-1



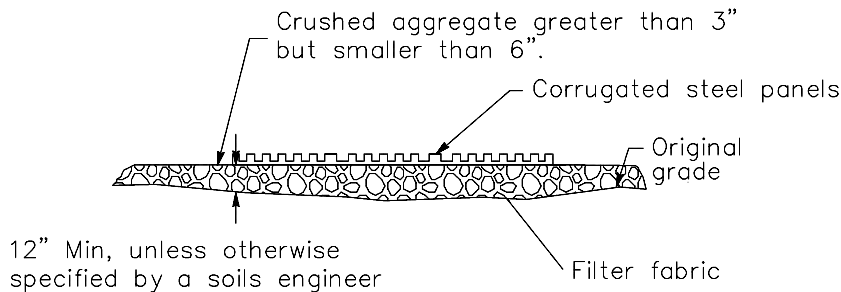
SECTION B-B
NTS



Stabilized Construction Entrance/Exit TC-1



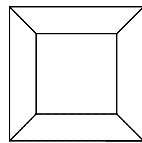
SECTION B-B
NTS



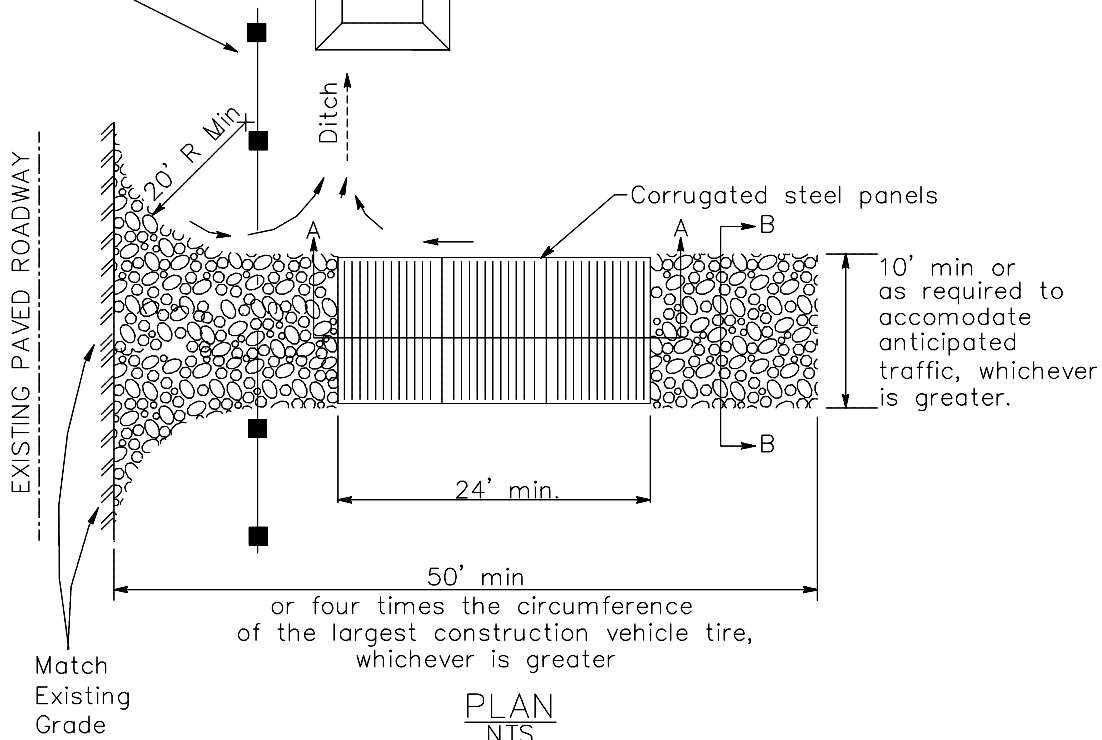
SECTION A-A
NOT TO SCALE

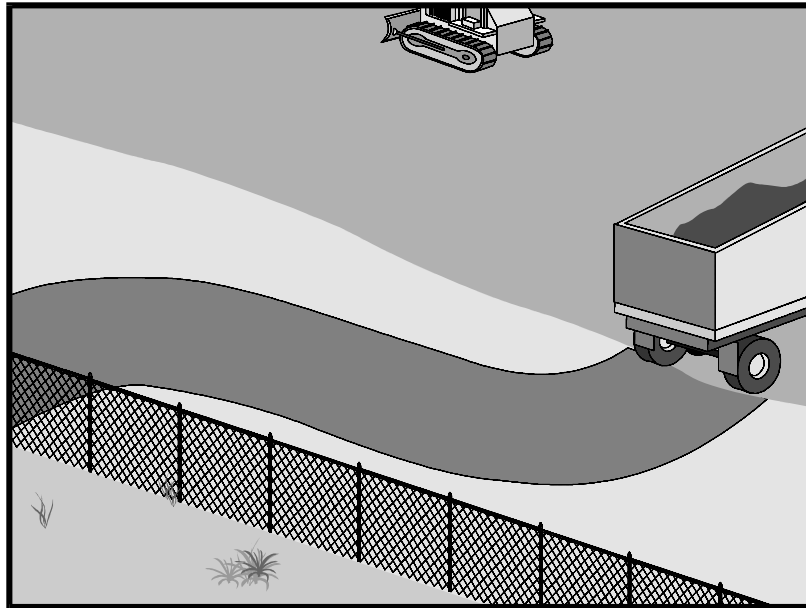
NOTE:

Construct sediment barrier and channelize runoff to sediment trapping device



Sediment trapping device





Categories

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TC	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
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, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

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

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

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

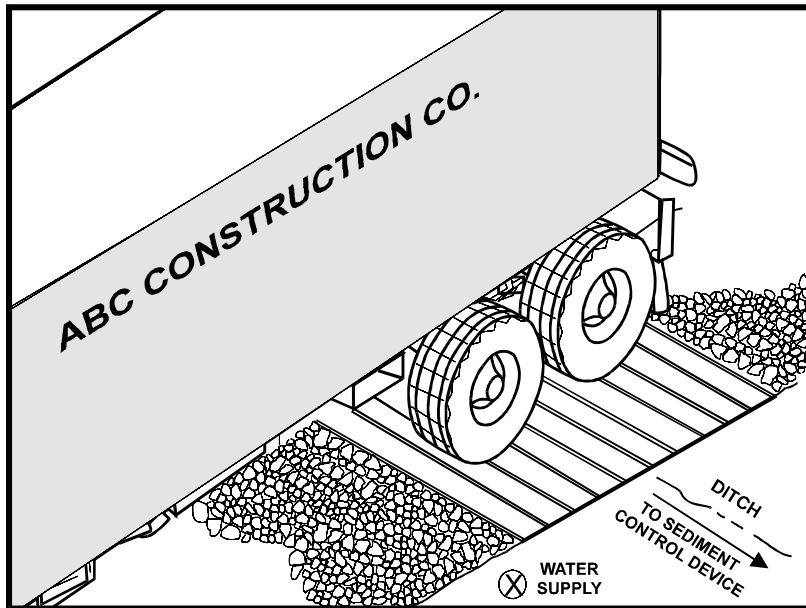
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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

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

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

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



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

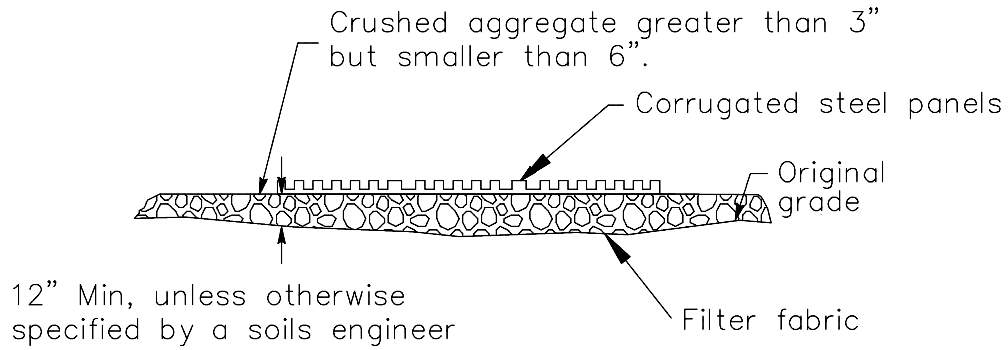
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

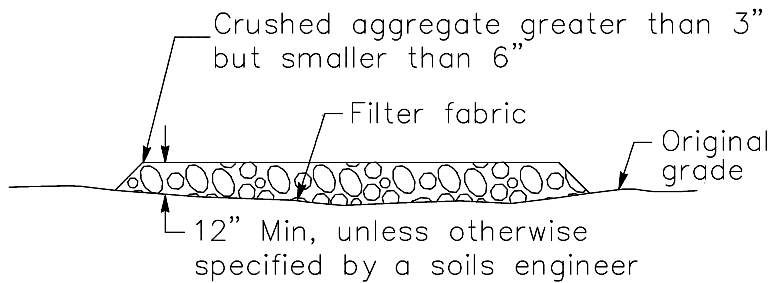
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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

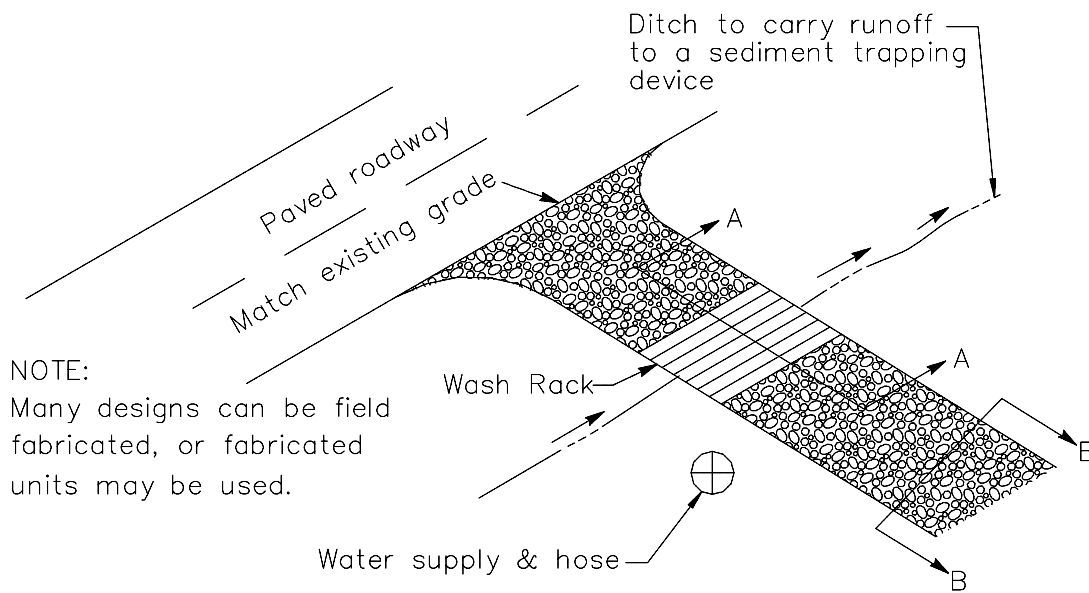
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



SECTION A-A
NOT TO SCALE



SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

Targeted Constituents

<input checked="" type="checkbox"/>	Sediment	▲
<input checked="" type="checkbox"/>	Nutrients	●
<input checked="" type="checkbox"/>	Trash	●
<input checked="" type="checkbox"/>	Metals	▲
<input checked="" type="checkbox"/>	Bacteria	●
<input checked="" type="checkbox"/>	Oil and Grease	▲
<input checked="" type="checkbox"/>	Organics	▲

Legend (Removal Effectiveness)

- Low
- High
- ▲ Medium



- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are more susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, whichever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data

Removal Efficiencies (% Removal)							
Study	TSS	TP	TN	NO ₃	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42-62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2-16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46-73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70-80	-	dry swale
Dorman et al., 1989	98	18	-	45	37-81	-	dry swale
Harper, 1988	87	83	84	80	88-90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37-69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

- 1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.
- 2) A design grass height of 6 inches is recommended.
- 3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.
- 4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.
- 5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).
- 6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.
- 7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately \$0.25 per ft². This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately \$0.50 per ft², which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost			Total Cost		
			Low	Moderate	High	Low	Moderate	High
Mobilization / Demobilization -Light	Swale	1	\$107	\$274	\$441	\$107	\$274	\$441
Site Preparation								
Clearing ^a	Acres	0.5	\$2,200	\$3,800	\$5,400	\$1,100	\$1,900	\$2,700
Grubbing ^b	Acres	0.25	\$3,800	\$5,200	\$6,600	\$950	\$1,300	\$1,650
General Excavation ^c	Yd ³	372	\$2,10	\$3,70	\$5,30	\$781	\$1,376	\$1,972
Level and Till ^e	Yd ²	1,210	\$0.20	\$0.35	\$0.50	\$242	\$424	\$605
Sites Development								
Salvaged Topsoil	Yd ²	1,210	\$0.40	\$1.00	\$1.60	\$484	\$1,210	\$1,936
Seed, and Mulch ^f	Yd ²	1,210	\$1.20	\$2.40	\$3.60	\$1,452	\$2,904	\$4,356
Sods ^g								
Subtotal	--	--	--	--	--	\$5,116	\$9,388	\$13,660
Contingencies	Swale	1	25%	25%	25%	\$1,279	\$2,347	\$3,415
Total	--	--	--	--	--	\$6,395	\$11,735	\$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

^a Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

^b Area cleared = (top width + 10 feet) x swale length.

^c Area grubbed = (top width x swale length).

^d Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

^e Area tilled = (top width + $\frac{8(\text{swale depth})^2}{3(\text{top width})}$) x swale length (parabolic cross-section).

^f Area seeded = area cleared x 0.5.

^g Area sodded = area cleared x 0.5.

Vegetated Swale

TC-30

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	\$0.85 / 1,000 ft ² /mowing	\$0.14 / linear foot	\$0.21 / linear foot	Lawn maintenance area = (top width + 10 feet) x length. Mow eight times per year
General Lawn Care	\$9.00 / 1,000 ft ² / year	\$0.18 / linear foot	\$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	\$0.10 / linear foot / year	\$0.10 / linear foot	\$0.10 / linear foot	-
Grass Reseeding with Mulch and Fertilizer	\$0.30 / yd ²	\$0.01 / linear foot	\$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	\$0.15 / linear foot / year, plus \$25 / inspection	\$0.15 / linear foot	\$0.15 / linear foot	Inspect four times per year
Total	--	\$0.58 / linear foot	\$0.75 / linear foot	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately \$2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

References and Sources of Additional Information

Barrett, Michael E., Walsh, Patrick M., Malina, Joseph F., Jr., Charbeneau, Randall J, 1998, "Performance of vegetative controls for treating highway runoff," *ASCE Journal of Environmental Engineering*, Vol. 124, No. 11, pp. 1121-1128.

Brown, W., and T. Schueler. 1997. *The Economics of Stormwater BMPs in the Mid-Atlantic Region*. Prepared for the Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD.

Center for Watershed Protection (CWP). 1996. *Design of Stormwater Filtering Systems*. Prepared for the Chesapeake Research Consortium, Solomons, MD, and USEPA Region V, Chicago, IL, by the Center for Watershed Protection, Ellicott City, MD.

Colwell, Shanti R., Horner, Richard R., and Booth, Derek B., 2000. *Characterization of Performance Predictors and Evaluation of Mowing Practices in Biofiltration Swales*. Report to King County Land And Water Resources Division and others by Center for Urban Water Resources Management, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

Dorman, M.E., J. Hartigan, R.F. Steg, and T. Quasebarth. 1989. *Retention, Detention and Overland Flow for Pollutant Removal From Highway Stormwater Runoff. Vol. 1*. FHWA/RD 89/202. Federal Highway Administration, Washington, DC.

Goldberg. 1993. *Dayton Avenue Swale Biofiltration Study*. Seattle Engineering Department, Seattle, WA.

Harper, H. 1988. *Effects of Stormwater Management Systems on Groundwater Quality*. Prepared for Florida Department of Environmental Regulation, Tallahassee, FL, by Environmental Research and Design, Inc., Orlando, FL.

Kercher, W.C., J.C. Landon, and R. Massarelli. 1983. Grassy swales prove cost-effective for water pollution control. *Public Works*, 16: 53–55.

Koon, J. 1995. *Evaluation of Water Quality Ponds and Swales in the Issaquah/East Lake Sammamish Basins*. King County Surface Water Management, Seattle, WA, and Washington Department of Ecology, Olympia, WA.

Metzger, M. E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. 2002. The Dark Side Of Stormwater Runoff Management: Disease Vectors Associated With Structural BMPs. *Stormwater* 3(2): 24-39.

Oakland, P.H. 1983. An evaluation of stormwater pollutant removal

through grassed swale treatment. In *Proceedings of the International Symposium of Urban Hydrology, Hydraulics and Sediment Control*, Lexington, KY. pp. 173–182.

Occoquan Watershed Monitoring Laboratory. 1983. Final Report: *Metropolitan Washington Urban Runoff Project*. Prepared for the Metropolitan Washington Council of Governments, Washington, DC, by the Occoquan Watershed Monitoring Laboratory, Manassas, VA.

Pitt, R., and J. McLean. 1986. *Toronto Area Watershed Management Strategy Study: Humber River Pilot Watershed Project*. Ontario Ministry of Environment, Toronto, ON.

Schueler, T. 1997. Comparative Pollutant Removal Capability of Urban BMPs: A reanalysis. *Watershed Protection Techniques* 2(2):379–383.

Seattle Metro and Washington Department of Ecology. 1992. *Biofiltration Swale Performance: Recommendations and Design Considerations*. Publication No. 657. Water Pollution Control Department, Seattle, WA.

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

U.S. EPA, 1999, Stormwater Fact Sheet: Vegetated Swales, Report # 832-F-99-006 <http://www.epa.gov/owm/mtb/vegswale.pdf>, Office of Water, Washington DC.

Wang, T., D. Spyridakis, B. Mar, and R. Horner. 1981. *Transport, Deposition and Control of Heavy Metals in Highway Runoff*. FHWA-WA-RD-39-10. University of Washington, Department of Civil Engineering, Seattle, WA.

Washington State Department of Transportation, 1995, *Highway Runoff Manual*, Washington State Department of Transportation, Olympia, Washington.

Welborn, C., and J. Veenhuis. 1987. *Effects of Runoff Controls on the Quantity and Quality of Urban Runoff in Two Locations in Austin, TX*. USGS Water Resources Investigations Report No. 87-4004. U.S. Geological Survey, Reston, VA.

Yousef, Y., M. Wanielista, H. Harper, D. Pearce, and R. Tolbert. 1985. *Best Management Practices: Removal of Highway Contaminants By Roadside Swales*. University of Central Florida and Florida Department of Transportation, Orlando, FL.

Yu, S., S. Barnes, and V. Gerde. 1993. *Testing of Best Management Practices for Controlling Highway Runoff*. FHWA/VA-93-R16. Virginia Transportation Research Council, Charlottesville, VA.

Information Resources

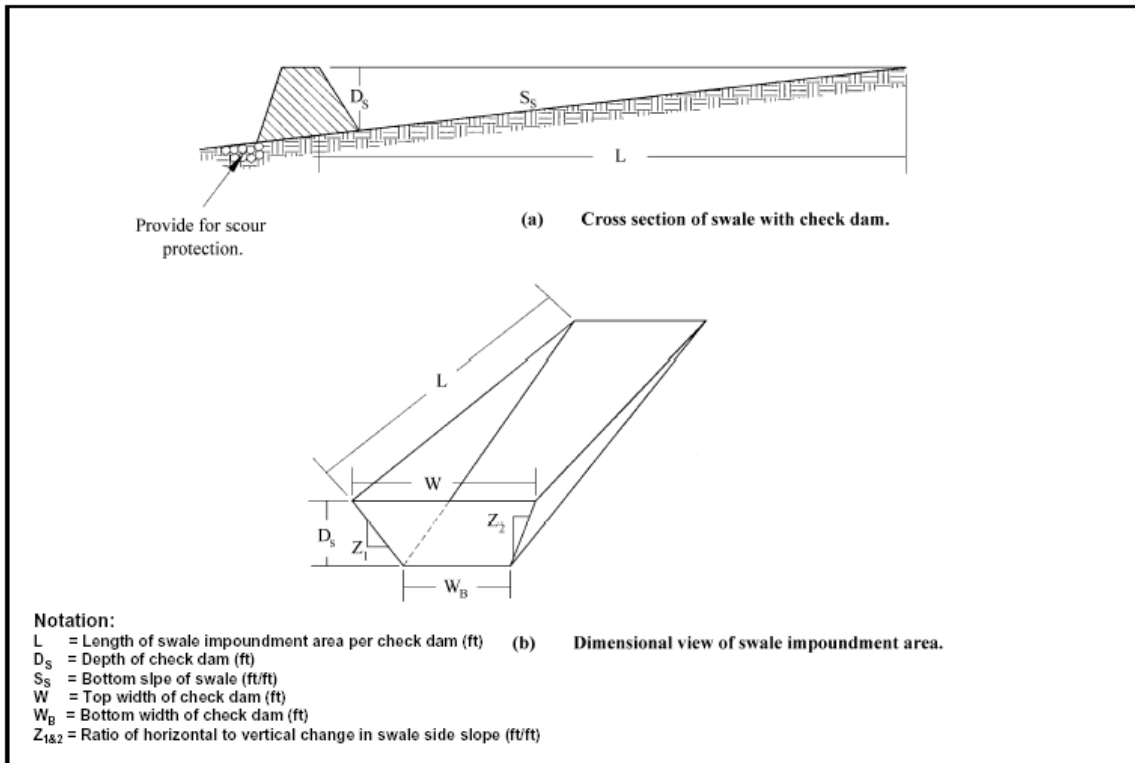
Maryland Department of the Environment (MDE). 2000. *Maryland Stormwater Design Manual*. www.mde.state.md.us/environment/wma/stormwatermanual. Accessed May 22, 2001.

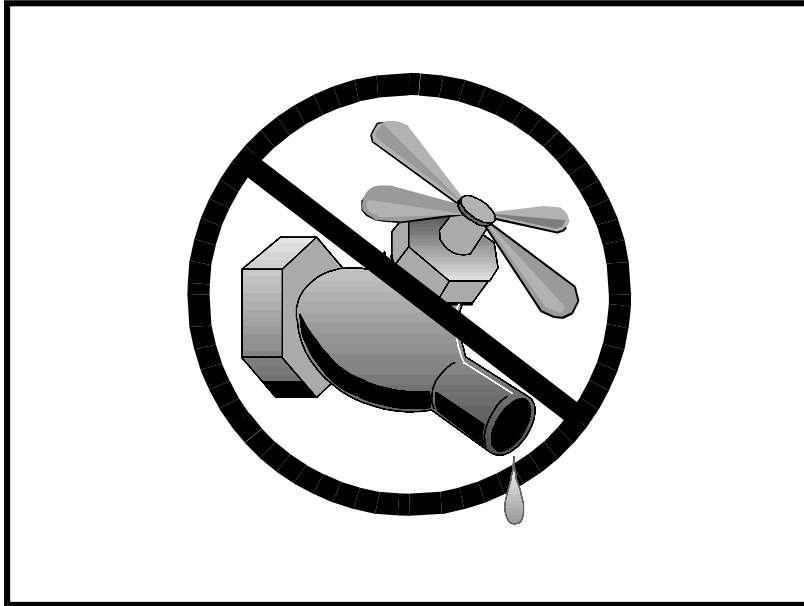
Reeves, E. 1994. Performance and Condition of Biofilters in the Pacific Northwest. *Watershed Protection Techniques* 1(3):117–119.

Seattle Metro and Washington Department of Ecology. 1992. *Biofiltration Swale Performance. Recommendations and Design Considerations*. Publication No. 657. Seattle Metro and Washington Department of Ecology, Olympia, WA.

USEPA 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA-840-B-92-002. U.S. Environmental Protection Agency, Office of Water. Washington, DC.

Watershed Management Institute (WMI). 1997. *Operation, Maintenance, and Management of Stormwater Management Systems*. Prepared for U.S. Environmental Protection Agency, Office of Water. Washington, DC, by the Watershed Management Institute, Ingleside, MD.





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.

Objectives

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



- 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

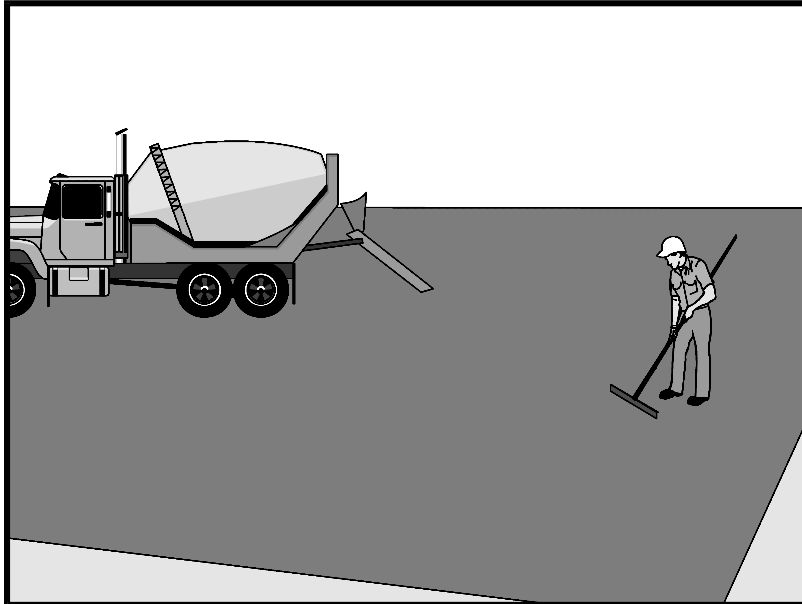
The cost is small to none compared to the benefits of conserving water.

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 occurring.
- 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.



Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runoff and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

Legend:

- Primary Category**
- Secondary Category**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runoff (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
 - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of) or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
 - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
 - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
 - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

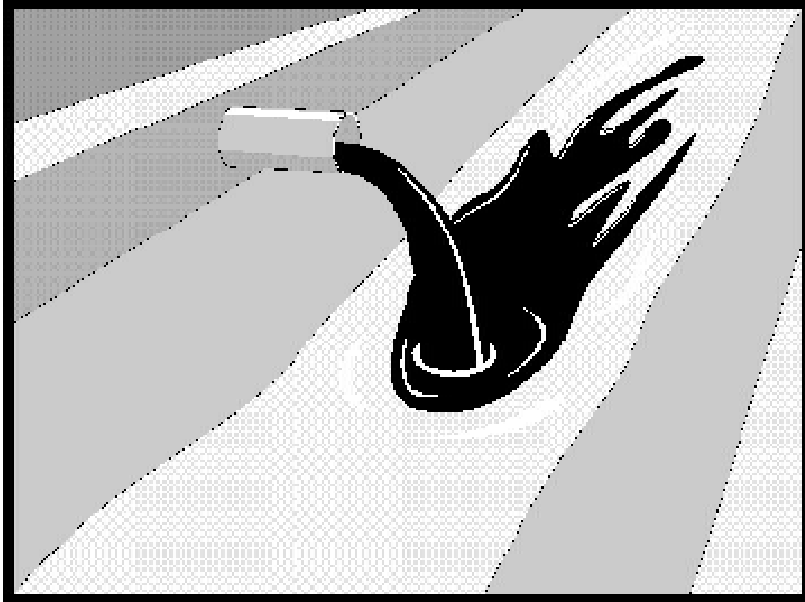
References

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

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

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

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



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.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



- 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

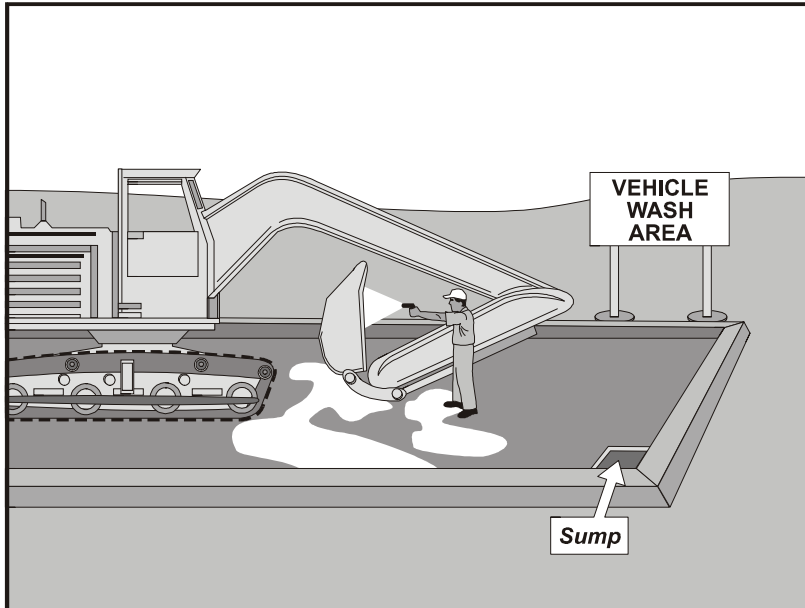
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect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



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:

Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



NS-8 Vehicle and Equipment Cleaning

- 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 runoff 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.

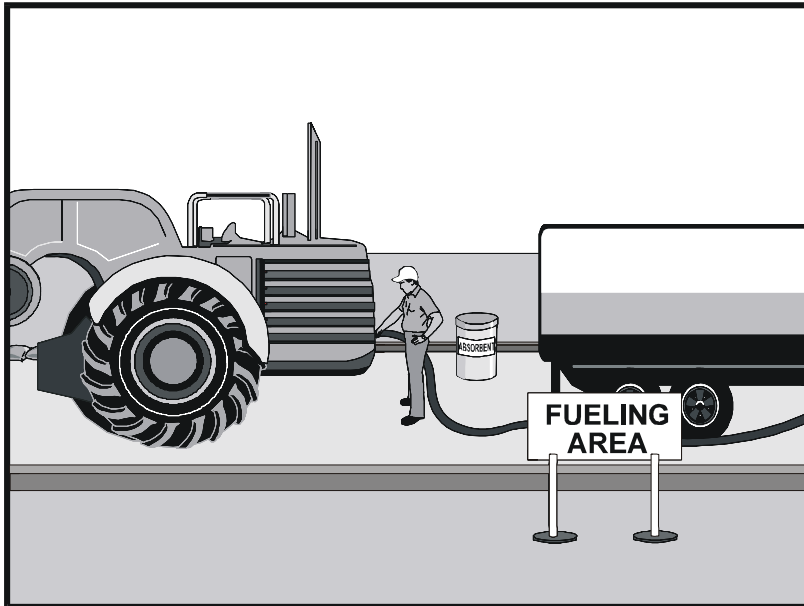
Inspection and Maintenance

- 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.



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.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



- 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 runoff 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 runoff, 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.

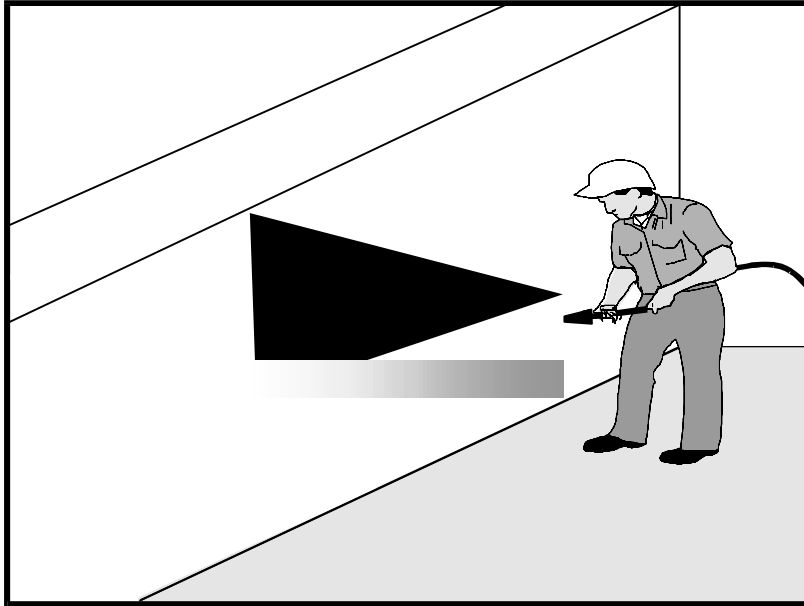
References

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.



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.

Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



- 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

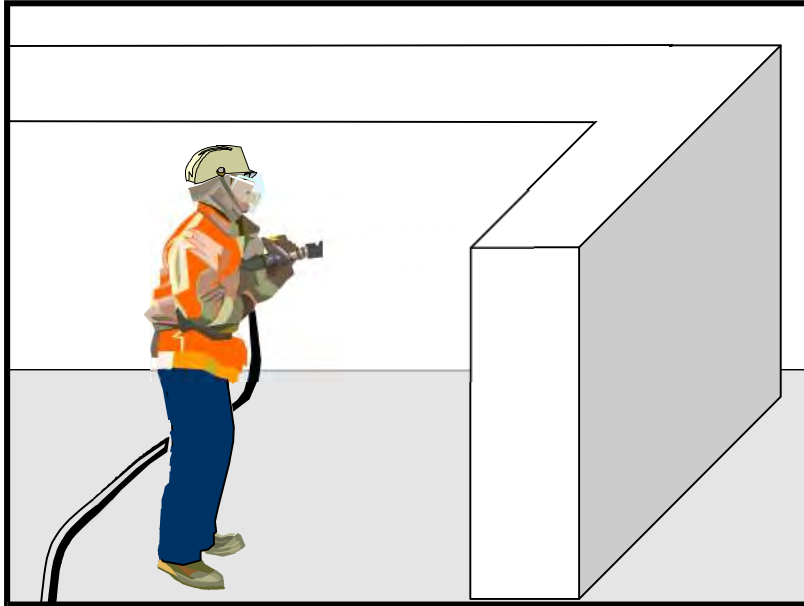
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect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



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	<input checked="" type="checkbox"/>

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

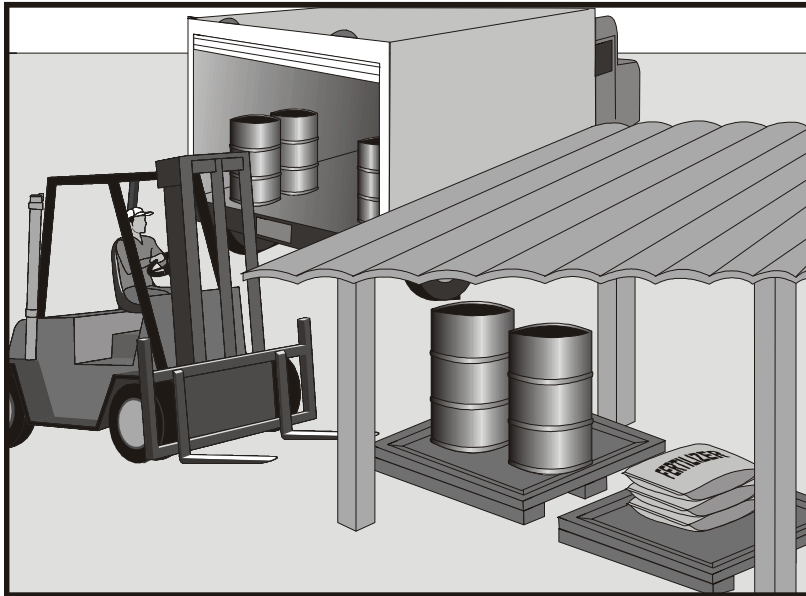
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect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



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

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



- 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.

WM-1 **Material Delivery and Storage**

- 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.

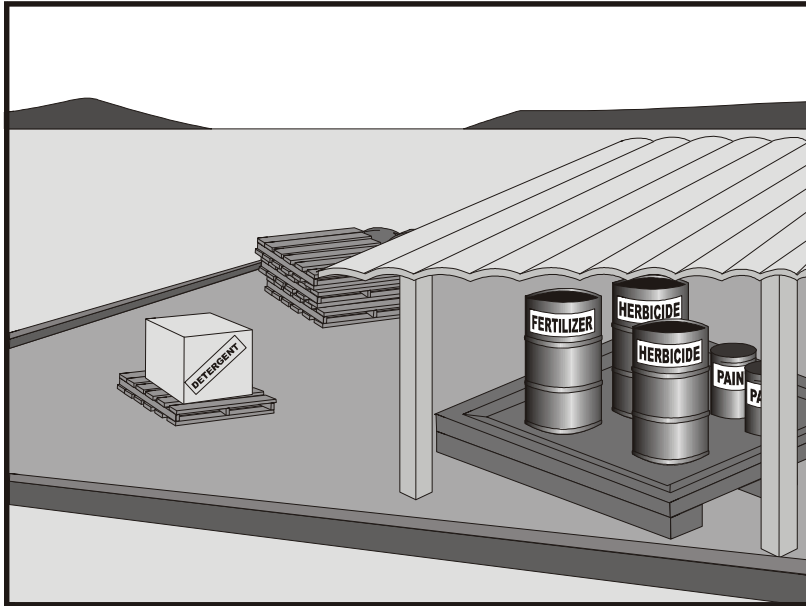
References

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.



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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

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.



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 runoff using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



- 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.

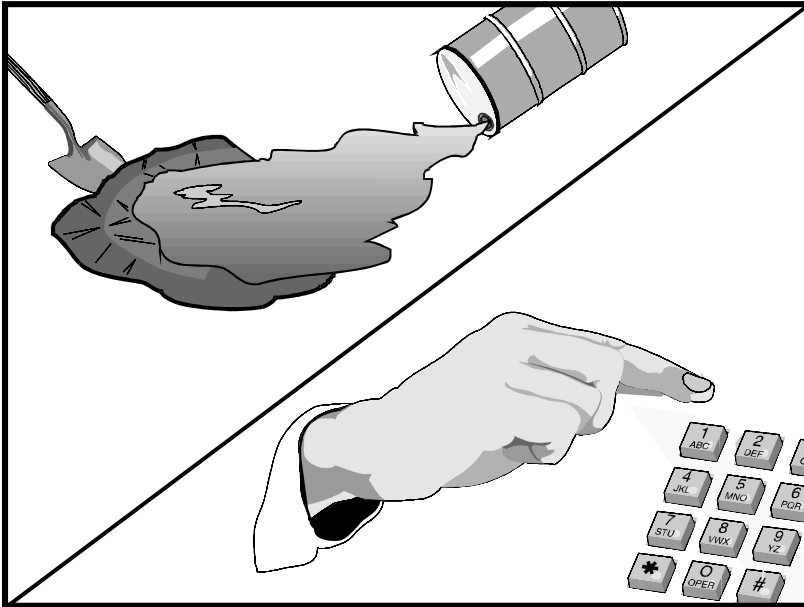
Inspection and Maintenance

- 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.



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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

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 runoff 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 runoff 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 runoff 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.

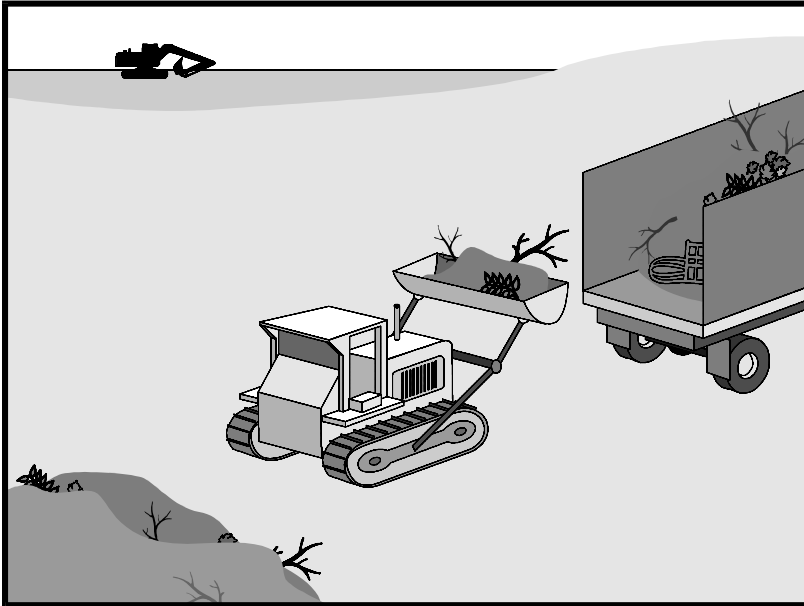
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

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



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

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



- 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 runoff 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

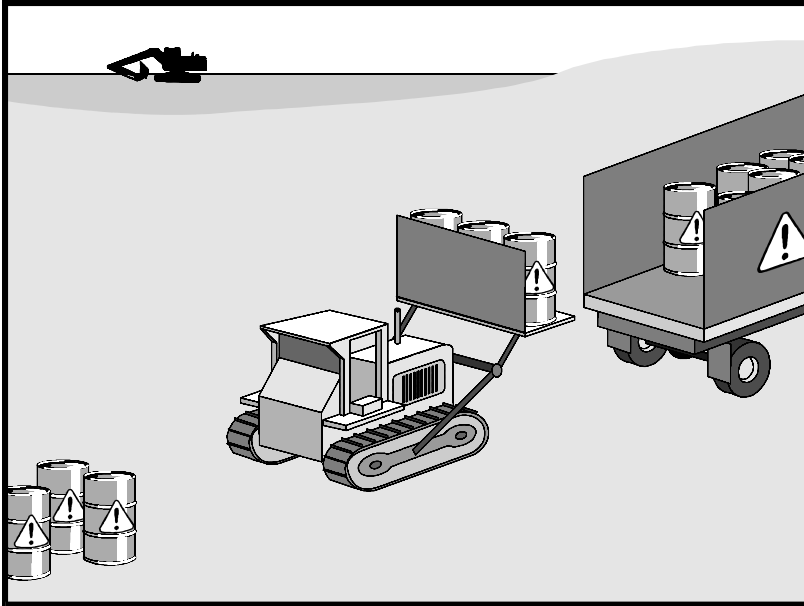
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect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



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
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- 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

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



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.

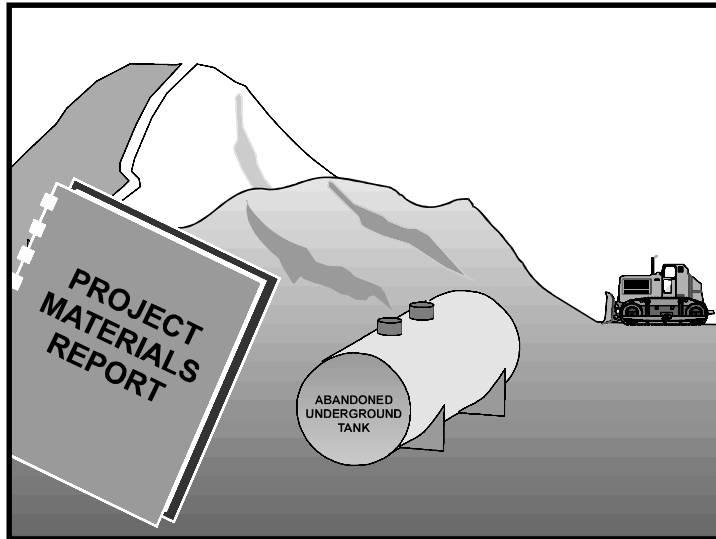
References

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Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

Legend:

- Primary Objective
- Secondary Objective

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
 - Past site uses and activities
 - Detected or undetected spills and leaks
 - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
 - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
 - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
 - Cover the stockpile with plastic sheeting or tarps.
 - Install a berm around the stockpile to prevent runoff from leaving the area.
 - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
 - United States Department of Transportation (USDOT)
 - United States Environmental Protection Agency (USEPA)
 - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

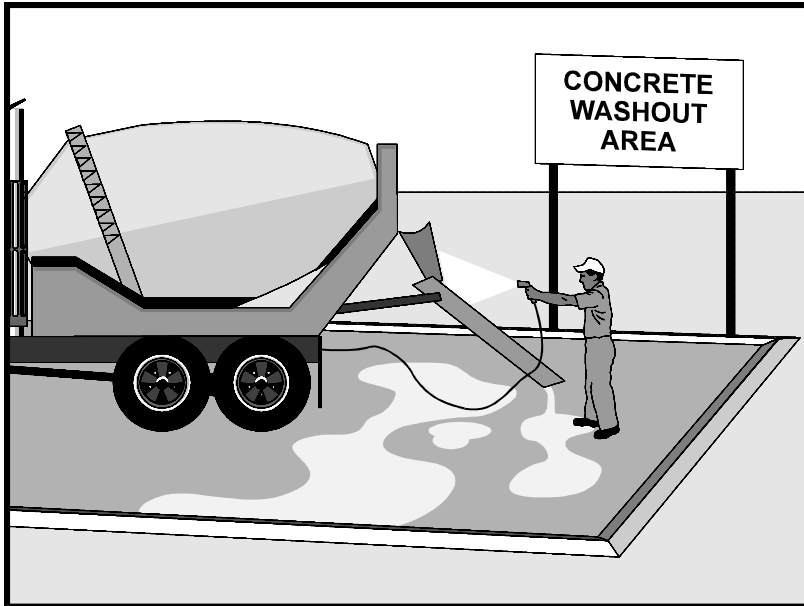
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



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 from 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.

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



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

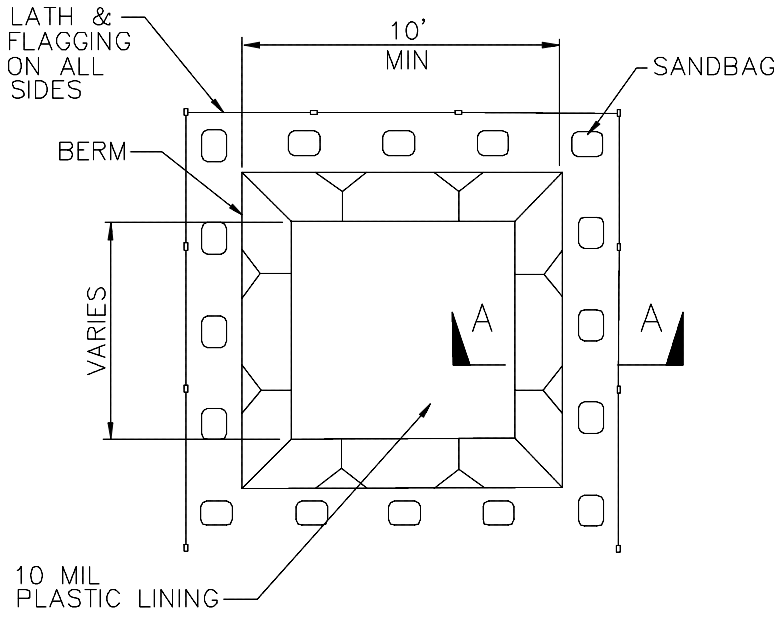
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Temporary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

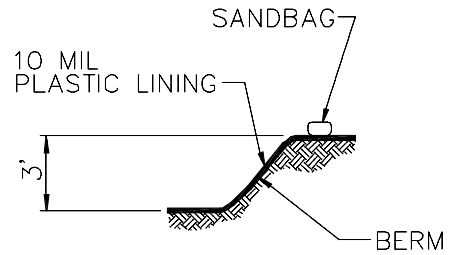
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

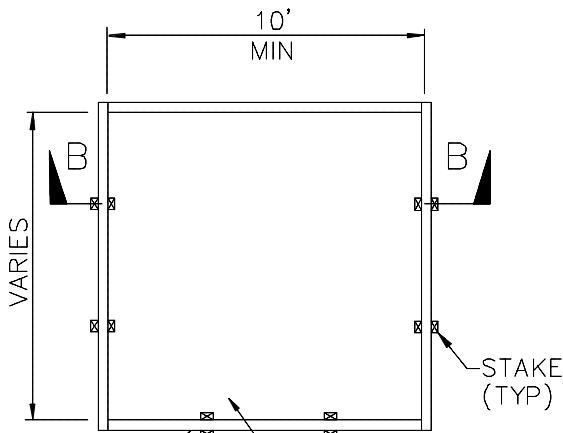
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



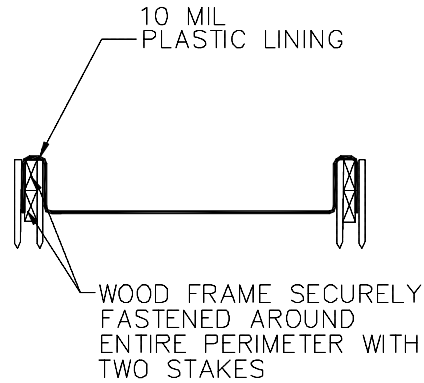
PLAN
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TYPE "BELOW GRADE"



SECTION A-A
NOT TO SCALE



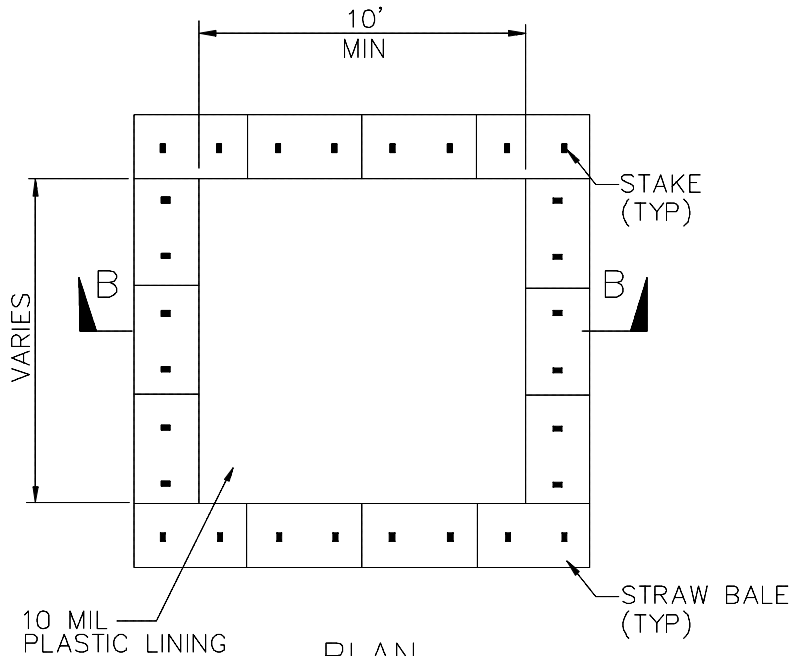
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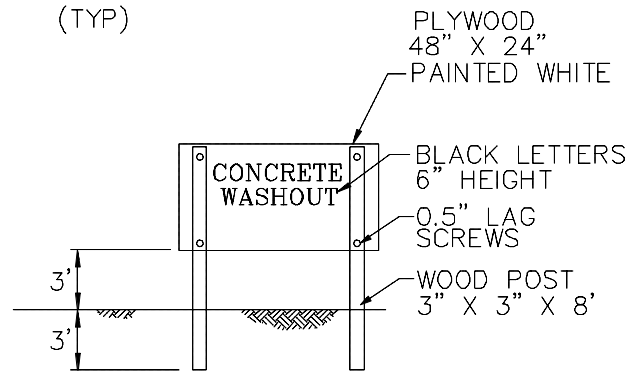
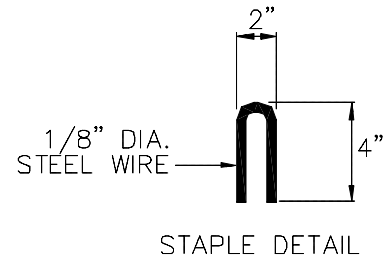
SECTION B-B
NOT TO SCALE

NOTES

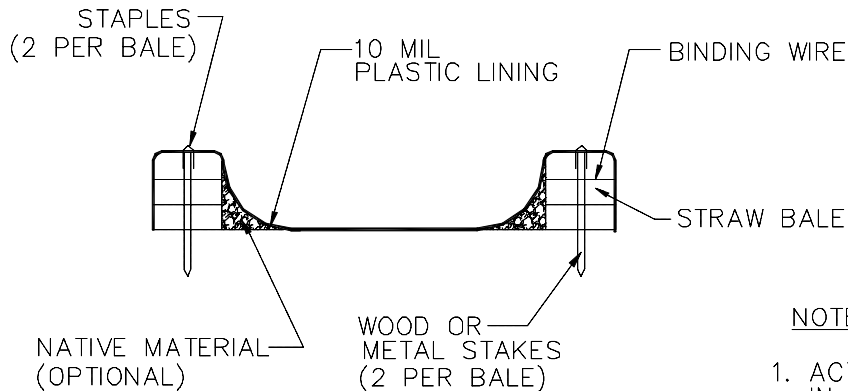
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



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



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

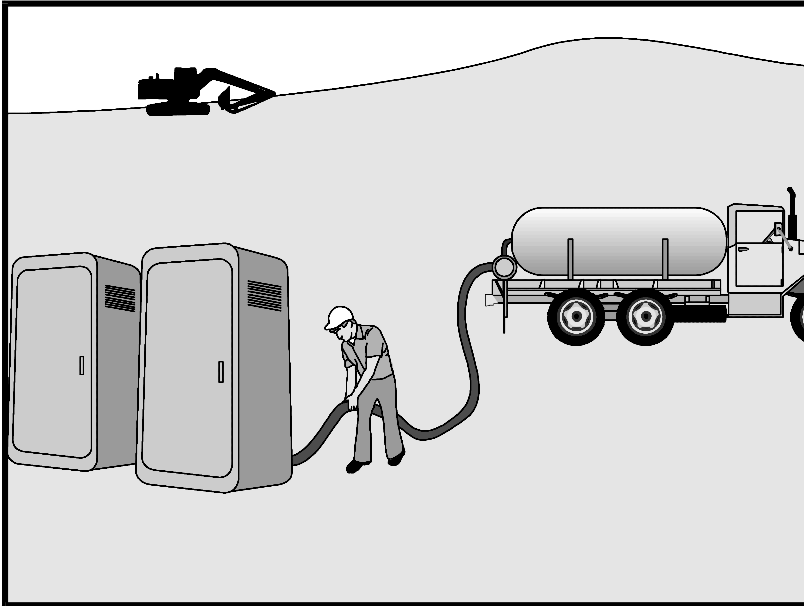


SECTION B-B
NOT TO SCALE

NOTES

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

Sanitary/Septic Waste Management WM-9



Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. 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.

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	<input checked="" type="checkbox"/>

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	
Organics	<input checked="" type="checkbox"/>

Potential Alternatives

None



WM-9 Sanitary/Septic Waste Management

- 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

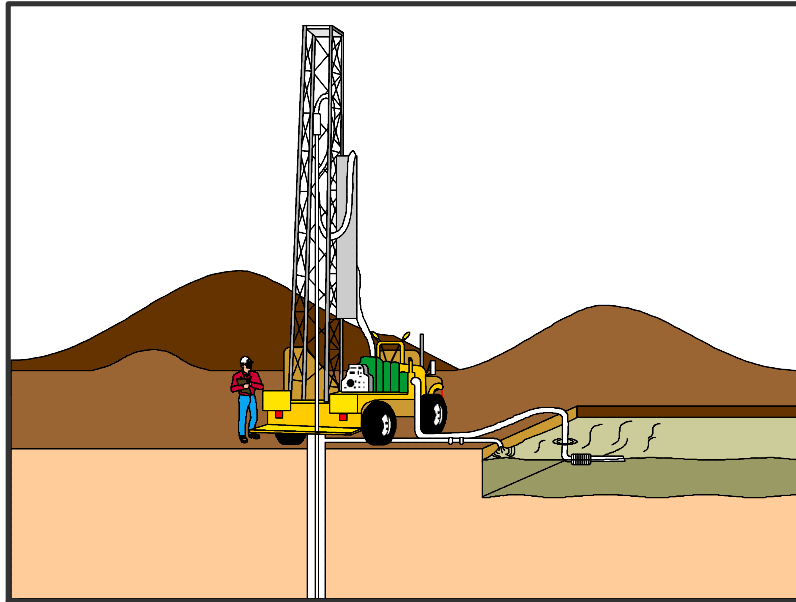
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.

Sanitary/Septic Waste Management WM-9

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.



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

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	<input checked="" type="checkbox"/>

Legend:

- Primary Objective**
- Secondary Objective**

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input type="checkbox"/>

Potential Alternatives

None



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.

Spill Prevention, Control & Cleanup SC-11



Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>



SC-11 Spill Prevention, Control & Cleanup

- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- If consistent illegal dumping is observed at the facility:
 - Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
 - Landscaping and beautification efforts may also discourage illegal dumping.
 - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.
- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.
- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.
- Routine maintenance:
 - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
 - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site’s spill control plan and/or proper spill cleanup procedures.
 - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

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- Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.
- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, 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 a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:
 - Types and quantities (in some cases) of wastes
 - Patterns in time of occurrence (time of day/night, month, or year)

SC-11 Spill Prevention, Control & Cleanup

- Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

Training

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
 - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
 - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.
- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

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Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

SC-11 Spill Prevention, Control & Cleanup

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

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- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect 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.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent 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 contaminate 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 your oil supplier or recycler about recycling oil filters.

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- 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

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
 - Cover fueling area if possible.
 - Use a perimeter drain or slope pavement inward with drainage to a sump.
 - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage “topping-off” of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

Spill Prevention, Control & Cleanup SC-11

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Stormwater Managers Resource Center <http://www.stormwatercenter.net/>

APPENDIX I: BMP INSPECTION FORM

BMP INSPECTION REPORT

Date and Time of Inspection:		Date Report Written:		
Inspection Type: (Circle one)	Weekly <i>Complete Parts I, II, III and VII</i>	Pre-Storm <i>Complete Parts I, II, III, IV and VII</i>	During Rain Event <i>Complete Parts I, II, III, V, and VII</i>	Post-Storm <i>Complete Parts I, II, III, VI and VII</i>
Part I. General Information				
Site Information				
Construction Site Name: Butte Regional Transit Operations Center				
Construction stage and completed activities:			Approximate area of site that is exposed:	
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:	
Weather				
Estimate storm beginning: (date and time)		Estimate storm duration: (hours)		
Estimate time since last storm: (days or hours)		Rain gauge reading and location: (in)		
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:				
Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.				
Inspector Information				
Inspector Name:			Inspector Title:	
Signature:			Date:	

Part II. BMP Observations. Describe deficiencies in Part III.

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

Part II. BMP Observations Continued. Describe deficiencies in Part III.

Minimum BMPs for Risk Level _____ Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-Stormwater discharges are properly controlled			
Vehicles are washed in a manner to prevent non-stormwater discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-stormwater discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Linear sediment control along toe of slope, face of slope an at grade breaks (Risk Level 2 & 3 Only)			
Limit construction activity to and from site to entrances and exits that employ effective controls to prevent offsite tracking (Risk Level 2 & 3 Only)			

Ensure all storm, drain inlets and perimeter controls, runoff control BMPs and pollutants controls at entrances and exits are maintained and protected from activities the reduce their effectiveness (Risk Level 2 & 3 Only)			
Inspect all immediate access roads daily (Risk Level 2 & 3 Only)			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

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

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

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

Discharge Location, Storage or Containment Area	Visual Observation

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

Required Actions	Implementation Date

BCAG		WDID: XXXXX			Risk Level 2	
Visual Inspection Field Log Sheet						
Inspection Date & Time:				Inspector Name:		
Inspection Type:	<input type="checkbox"/> Weekly	<input type="checkbox"/> Before predicted rain	<input type="checkbox"/> During rain event	<input type="checkbox"/> Following qualifying rain event	<input type="checkbox"/> Contained stormwater release	<input type="checkbox"/> Quarterly non-stormwater
Site Information						
Construction stage and completed activities:					Approximate area of exposed site:	
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____		Estimate storm duration: _____		Estimate time since last storm: _____	Rain gauge reading: _____	
(date and time)		(hours)		(days or hours)	(inches)	
Observations: If yes identify location						
Odors		Yes <input type="checkbox"/> No <input type="checkbox"/>		Sheen		Yes <input type="checkbox"/> No <input type="checkbox"/>
Floating material		Yes <input type="checkbox"/> No <input type="checkbox"/>		Discolorations		Yes <input type="checkbox"/> No <input type="checkbox"/>
Suspended Material		Yes <input type="checkbox"/> No <input type="checkbox"/>		Turbidity		Yes <input type="checkbox"/> No <input type="checkbox"/>
Site Inspections						
Outfalls or BMPs Evaluated				Deficiencies Noted		
Photos Taken:				Yes <input type="checkbox"/> No <input type="checkbox"/>	Photo Reference IDs:	
Corrective Actions Identified (note if SWPPP/REAP change is needed)						

APPENDIX J: RAIN EVENT ACTION PLAN TEMPLATE

Rain Event Action Plan (REAP) BCAG Project

Date of REAP		WDID Number:	XXXXX
Date Rain Predicted to Occur:		Predicted % chance of rain:	

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. Each active Trade should check all material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work to ensure the proper implementation of BMPs. Project-wide BMPs should be checked.

Trade or Activity	Suggested action(s) to perform / item(s) to review prior to rain event
Information & Scheduling	<input type="checkbox"/> Inform trade supervisors of predicted rain. Check scheduled activities and reschedule as needed <input type="checkbox"/> Alert erosion/sediment control provider <input type="checkbox"/> Coordinate access for storm water sampling with QSD if more than ½ inch rain predicted <input type="checkbox"/> Schedule staff for extended rain inspections (including weekends & holidays) <input type="checkbox"/> Review WPCDs and project schedule <input type="checkbox"/> Other:
Material Storage Areas & Waste Management Areas & Contractor Yards	<input type="checkbox"/> Material under cover or in sheds (ex: treated woods, concrete, and metals) <input type="checkbox"/> Perimeter control around stockpiles <input type="checkbox"/> Dumpsters & recycle bins closed with drain holes plugged <input type="checkbox"/> Sanitary stations bermed and protected from tipping <input type="checkbox"/> Other:
General & Trade Operations	<input type="checkbox"/> Exterior operations shut down for event (e.g., no concrete pours or paving) <input type="checkbox"/> Soil treatments (e.g: fertilizer) ceased within 24 hours of event <input type="checkbox"/> Materials and equipment (e.g: tools) properly stored and covered <input type="checkbox"/> Waste and debris disposed in covered dumpsters or removed from site <input type="checkbox"/> Trenches and excavations protected <input type="checkbox"/> Perimeter controls around disturbed areas <input type="checkbox"/> Entry/Exit onto public roadways clear of tracking <input type="checkbox"/> Fueling and repair areas covered and bermed <input type="checkbox"/> Other:
BMPs	<input type="checkbox"/> Verify that BMPs are in functional condition, or that repairs were made as needed <input type="checkbox"/> Check Erosion and Sediment Control (ESC) material stock <input type="checkbox"/> Other:
Trackway Work	<input type="checkbox"/> Cover concrete ties if stored near any potential storm water concentration, or if adjacent to Environmentally Sensitive Area or protected water body <input type="checkbox"/> Verify Environmental BMPs and Mitigation Measures implemented as appropriate <input type="checkbox"/> Verify that Slope Length Limiting BMP installed appropriately
Crossing Improvements	<input type="checkbox"/> Entry/Exit onto public roadways clear of tracking <input type="checkbox"/> Verify Environmental BMPs and Mitigation Measures implemented as appropriate

Culvert Replacement & Bridge Work	<input type="checkbox"/> Cover concrete to the maximum extent practical. Special attention near any potential storm water concentration, or if adjacent to Environmentally Sensitive Area or protected water body <input type="checkbox"/> Verify Environmental BMPs and Mitigation Measures implemented as appropriate <input type="checkbox"/> Stream bank and wetland protection measures in place and functional <input type="checkbox"/> Inlet/Outlet protection in place and functional
Other / Notes / Sketches / Concerns	
Attach a printout of the weather forecast from the NOAA website to the REAP.	
<p>I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.</p>	
<p>_____ Qualified SWPPP QSP (Use ink please) Date: _____</p>	

APPENDIX K: TRAINING REPORTING FORM

Trained Contractor Personnel Log

Stormwater Management Training Log and Documentation

Project Name: Butte Regional Transit Operations Center

WDID #: xxxxxxx

Stormwater Management Topic: (check as appropriate)

- Erosion Control Sediment Control
 Wind Erosion Control Tracking Control
 Non-Stormwater Management Waste Management and Materials Pollution Control
 Stormwater Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

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

APPENDIX K1: Training & Certification Document

APPENDIX L: RESPONSIBLE PARTIES

Identification of QSP and QSD

Project Name: Butte Regional Transit Operations Center

WDID #: XXXXXX

The following are QSPs associated with this project

Name of Personnel ⁽¹⁾	Company	Date
- QSP		
Steve Grupico - QSD	GHD	

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

APPENDIX M: CONTRACTORS AND SUBCONTRACTORS

APPENDIX N: CGP ATTACHMENT



Linda S. Adams
Secretary for
Environmental Protection

State Water Resources Control Board



Arnold Schwarzenegger
Governor

Division of Water Quality

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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO. **CAS000002**

This Order was adopted by the State Water Resources Control Board on:	September 2, 2009
This Order shall become effective on:	July 1, 2010
This Order shall expire on:	September 2, 2014

IT IS HEREBY ORDERED, that this Order supersedes [Order No. 99-08-DWQ](#) except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend
Clerk to the Board

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LIST OF APPENDICES

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Appendix 2 – Post-Construction Water Balance Performance Standard
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**STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002**

**WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH
CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES**

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.
2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.
4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.
5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.
6. Pursuant to 40 C.F.R. § 131.12 and State Water Board [Resolution No. 68-16](#),¹ which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.
7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.
8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.
9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

¹ Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.
11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.
12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.
13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.
14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.
15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.
16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.
17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.
19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.
20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.
21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.
22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.²
23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

² Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.
25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.
26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.
27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.
28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.
29. Construction activity covered by an individual NPDES Permit for storm water discharges.
30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 ("R" in the Revised Universal Soil Loss Equation).
31. Landfill construction activity that is subject to the Industrial General Permit.
32. Construction activity that discharges to Combined Sewer Systems.
33. Conveyances that discharge storm water runoff combined with municipal sewage.
34. Discharges of storm water identified in CWA § 402(1)(2), 33 U.S.C. § 1342(1)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.
37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.
38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and [No. 2003-0007-DWQ](#). For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)³. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.
42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.
43. This General Permit prohibits the discharge of any debris⁴ from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.
45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

³ BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

⁴ Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.
47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.
48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.
49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.
50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS⁵) can prevent or reduce the release of fine particles from construction sites.

⁵ An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, "The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities," dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel's suggestions into this General Permit, which includes both numeric action levels (NALs) and NELs for pH and turbidity, and special numeric limits for ATS discharges.

Numeric Effluent Limitations

53. Discharges of storm water from construction activities may become contaminated from alkaline construction materials resulting in high pH (greater than pH 7). Alkaline construction materials include, but are not limited to, hydrated lime, concrete, mortar, cement kiln dust (CKD), Portland cement treated base (CTB), fly ash, recycled concrete, and masonry work. This General Permit includes an NEL for pH (6.0-9.0) that applies only at sites that exhibit a "high risk of high pH discharge." A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.
54. For Risk Level 3 discharges, this General Permit establishes technology-based, numeric effluent limitations (NELs) for turbidity of 500 NTU. Exceedances of the turbidity NEL constitutes a violation of this General Permit.

55. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based NELs for Risk Level 3 dischargers.

Determining Compliance with Numeric Limitations

56. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. The NALs in this General Permit for pH and turbidity are not directly enforceable and do not constitute NELs.

57. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is required to provide an NAL Exceedance Report when requested by a Regional Water Board.

58. If run-on is caused by a forest fire or any other natural disaster, then NELs do not apply.

59. Exceedances of the NELs are a violation of this Permit. This General Permit requires dischargers with NEL exceedances to implement additional monitoring, BMPs, and revise their SWPPPs accordingly. Dischargers are required to notify the State and Regional Water Boards of the violation through the State Water Boards SMARTs system, and provide an NEL Violation Report sharing additional information concerning the NEL exceedance.

I. Receiving Water Limitations

60. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

61. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

62. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.
63. For all Risk Level 3 and Risk Level 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.
64. Risk Level 3 sites in violation of the Numeric Effluent Limitations contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring.
65. For Risk Level 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.
66. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.
67. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.
68. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.
69. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

70. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially

cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

71. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.
72. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.
73. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.
74. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

75. This General Permit includes performance standards for post-construction that are consistent with State Water Board [Resolution No. 2005-0006](#), "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and [2008-0030](#), "Requiring Sustainable Water Resources Management." The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This "runoff reduction" approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.
76. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

77. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.
78. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

79. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)⁶:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.
2. The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.
3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

B. Obtaining Permit Coverage Traditional Construction Sites

⁶ These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.
2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.
3. PRDs shall consist of:
 - a. Notice of Intent (NOI)
 - b. Risk Assessment (Section VIII)
 - c. Site Map
 - d. Storm Water Pollution Prevention Plan (Section XIV)
 - e. Annual Fee
 - f. Signed Certification Statement

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.
 - a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.
 - b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated. Existing dischargers shall electronically file their PRDs no later than

July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.
6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOI prior to July 1, 2010, are not required to obtain coverage under this General Permit.
7. Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this

information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.
2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:
 - a. A revised NOI indicating the new project size;
 - b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.
 - c. SWPPP revisions, as appropriate; and
 - d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.
 - e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved “Final Stabilization” as defined in Section II.D.
4. When an LRP owns property with active General Permit coverage, and the LRP sells the property, or a parcel thereof, to another person, that person shall become an LRP with respect to whatever parcel was sold. The existing LRP shall inform the new LRP of the General Permit’s requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP’s approved signatory, must submit PRDs in accordance with this General Permit’s requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:
 - a. For purposes of “final stabilization,” the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;
 - b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;
 - c. Final stabilization has been reached;
 - d. Construction materials and wastes have been disposed of properly;
 - e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;
 - f. Post-construction storm water management measures have been installed and a long-term maintenance plan⁷ has been established; and

⁷ For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

- g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.
- 2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.
- 3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:
 - a. "70% final cover method," no computational proof required
 - OR:**
 - b. "RUSLE or RUSLE2 method," computational proof required
 - OR:**
 - c. "Custom method", the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the "final stabilization" requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

- A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.
- B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.
- C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:
 - 1. The discharge does not cause or contribute to a violation of any water quality standard;
 - 2. The discharge does not violate any other provision of this General Permit;
 - 3. The discharge is not prohibited by the applicable Basin Plan;
 - 4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.
 - 5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;
 - 6. The discharge is monitored and meets the applicable NALs and NELs; and
 - 7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

- D.** Debris resulting from construction activities are prohibited from being discharged from construction sites.

- E.** When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.
2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.
2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.
2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;
3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and
4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notice of Terminations (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS.
 - a. The LRP's Approved Signatory must be one of the following:
 - i. For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
 - ii. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;
 - iii. For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA);
 - iv. For the military: Any military officer who has been designated.
 - v. For a public university: An authorized university official

- b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.
2. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

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

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass⁸ is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;⁹

⁸ The intentional diversion of waste streams from any portion of a treatment facility

⁹ Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;
3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or
4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset¹⁰ in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
 - a. An upset occurred and that the discharger can identify the cause(s) of the upset
 - b. The treatment facility was being properly operated by the time of the upset
 - c. The discharger submitted notice of the upset as required; and
 - d. The discharger complied with any remedial measures required
2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.
3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

¹⁰ An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than \$10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed \$37,500¹¹ per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

¹¹ May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

V. EFFLUENT STANDARDS

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

B. Numeric Effluent Limitations (NELs)

Table 1- Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU	N/A
		Risk Level 3			250 NTU	500 NTU

1. Numeric Effluent Limitations (NELs):

- a. **Storm Event, Daily Average pH Limits** – For Risk Level 3 dischargers, the pH of storm water and non-storm water discharges

shall be within the ranges specified in Table 1 during any site phase where there is a "high risk of pH discharge."¹²

- b. **Storm Event Daily Average Turbidity Limit** – For Risk Level 3 dischargers, the turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.
2. If daily average sampling results are outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file monitoring results in violation within 5 business days of obtaining the results.
3. **Compliance Storm Event:**

Discharges of storm water from Risk Level 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for Risk Level 3 discharges is the 5 year, 24 hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

<http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif>
<http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif>

Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

C. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

¹² A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.
3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.
4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:
 - a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

AND/OR:

- b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

VI. RECEIVING WATER LIMITATIONS

- A.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.
- B.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.
- C.** The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).
- D.** Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:
 - a. A California registered professional civil engineer;
 - b. A California registered professional geologist or engineering geologist;
 - c. A California registered landscape architect;
 - d. A professional hydrologist registered through the American Institute of Hydrology;
 - e. A Certified Professional in Erosion and Sediment Control (CPESC)[™] registered through Enviro Cert International, Inc.;
 - f. A Certified Professional in Storm Water Quality (CPSWQ)[™] registered through Enviro Cert International, Inc.; or
 - g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.
3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:
 - a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or
 - b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.
5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.
6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,¹³ the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

¹³ Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres <http://cain.ice.ucdavis.edu/calwater/calwfaq.html>, <http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175> .

XIII. POST-CONSTRUCTION STANDARDS

- A.** All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.
1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.
 2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.
 3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.
 4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream¹⁴ or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

¹⁴ A first order stream is defined as a stream with no tributaries.

- B.** All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

- A.** The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:
1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;
 2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;
 3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;
 4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and
 5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.
- B.** To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.
- C.** The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

- A.** In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.
- B.** Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.
- C.** Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.
- D.** Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.
- E.** Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

- A.** All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.
- B.** The discharger shall certify each Annual Report in accordance with the Special Provisions.
- C.** The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.
- D.** The discharger shall include storm water monitoring information in the Annual Report consisting of:
 - 1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;
 - 2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");
 - 3. a summary of all corrective actions taken during the compliance year;
 - 4. identification of any compliance activities or corrective actions that were not implemented;
 - 5. a summary of all violations of the General Permit;
 - 6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;
 - 7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and
 - 8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.
- E.** The discharger shall provide training information in the Annual Report consisting of:
 - 1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and
3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

**ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS
OF THE GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY**

GENERAL INSTRUCTIONS

- A.** All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A & B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Waiver requirements shall pay a fee of \$200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
 - a. Post-Construction Water Balance Calculator (Appendix 2).
2. Dischargers who are proposing to implement ATS shall submit:
 - a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

- b. Certification proof that design done by a professional in accordance with Attachment F.
- 3. Dischargers who are proposing an alternate Risk Justification:
 - a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

1. Notice of Intent (NOI)
2. Site Map(s) Includes:
 - a. The project's surrounding area (vicinity)
 - b. Site layout
 - c. Construction site boundaries
 - d. Drainage areas
 - e. Discharge locations
 - f. Sampling locations
 - g. Areas of soil disturbance (temporary or permanent)
 - h. Active areas of soil disturbance (cut or fill)
 - i. Locations of all runoff BMPs
 - j. Locations of all erosion control BMPs
 - k. Locations of all sediment control BMPs
 - l. ATS location (if applicable)
 - m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
 - n. Locations of all post-construction BMPs
 - o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices
3. **SWPPPs**
A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.
4. **Risk Assessment**
All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.
 - a. The Standard Risk Assessment includes utilization of the following:
 - i. Receiving water Risk Assessment interactive map

- ii. EPA Rainfall Erosivity Factor Calculator Website
 - iii. Sediment Risk interactive map
 - iv. Sediment sensitive water bodies list
- b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator
5. **Post-Construction Water Balance Calculator**
All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.
6. **ATS Design Document and Certification**
All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT D RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:
 - a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.
 - b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.
2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:
 - a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

- c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).
 - d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.
2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
- a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.
 - d. Cover waste disposal containers at the end of every business day and during a rain event.
 - e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - g. Implement procedures that effectively address hazardous and non-hazardous spills.
 - h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:
 - i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

- ii. Appropriate spill response personnel are assigned and trained.
 - i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.
3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
- a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.
 - b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.
 - c. Clean leaks immediately and disposing of leaked materials properly.
4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
- a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - b. Contain all fertilizers and other landscape materials when they are not actively being used.
 - c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.
 - d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.
5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

- a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
 - b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
 - c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
 - d. Ensure retention of sampling, visual observation, and inspection records.
 - e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.
6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.
7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.
2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.
2. Risk Level 2 dischargers shall provide effective soil cover for inactive¹ areas and all finished slopes, open space, utility backfill, and completed lots.
3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA’s Construction BMP Guidance Handbook.
3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active² construction.
4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths³ in accordance with Table 1.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not
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¹ Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

² Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.

³ Sheet flow length is the length that shallow, low velocity flow travels across a site.

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

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.
6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.
7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).
2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.
3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or

design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.
5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:
 - a. Inspection date and date the inspection report was written.
 - b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
 - c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.
 - d. A description of any BMPs evaluated and any deficiencies noted.
 - e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.
 - f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
 - g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
 - h. Photographs taken during the inspection, if any.
 - i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall

ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at <http://www.srh.noaa.gov/forecast>).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).
3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:
 - a. Site Address
 - b. Calculated Risk Level (2 or 3)
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
 - d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number
4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:
 - a. Activities associated with each construction phase
 - b. Trades active on the construction site during each construction phase
 - c. Trade contractor information
 - d. Suggested actions for each project phase
5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:
 - a. Site Address
 - b. Calculated Risk Level (2 or 3)
 - c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
 - d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
 - e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

- f. Trades active on site during Inactive Construction
 - g. Trade contractor information
 - h. Suggested actions for inactive construction sites
6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.
7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

- a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.
- b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.
- c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. Objectives

The CSMP shall be developed and implemented to address the following objectives:

- a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.
 - b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.
 - c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.
 - d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.
- 3. Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**
- a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.
 - b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.
 - c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.
 - d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.
 - e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):
 - i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

- ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.
 - iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.
- f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.
 - g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.
 - h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. Risk Level 2 – Water Quality Sampling and Analysis

- a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.
- b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.
- c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of $\frac{1}{2}$ inch or more at the time of discharge).

Storm Water Effluent Monitoring Requirements

- d. Risk Level 2 dischargers shall analyze their effluent samples for:
 - i. pH and turbidity.

- ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations

Effluent Sampling Locations

- a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.
- b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.
- c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent⁴ the effluent in each drainage area based on visual observation of the water and upstream conditions.
- d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.
- e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.
- f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.
- g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. Risk Level 2 – Visual Observation and Sample Collection Exemptions

- a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk

⁴ For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

- i. During dangerous weather conditions such as flooding and electrical storms.
 - ii. Outside of scheduled site business hours.
- b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. Risk Level 2 – Storm Water Sample Collection and Handling Instructions

- a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.
- b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.
- c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).⁵

8. Risk Level 2 – Monitoring Methods

- a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:
 - i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.
 - ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample

⁵ Additional information regarding SWAMP's QAPrP and QAMP can be found at

http://www.waterboards.ca.gov/water_issues/programs/swamp/.

QAPrP: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.

QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml.

collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

- iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.
- b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. Risk Level 2 – Analytical Methods

- a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.
- b. **pH:** Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.
- c. **Turbidity:** Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements

a. Visual Monitoring Requirements:

- i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.
- ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).
- iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

- i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.
- ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.
- iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. Risk Level 2 – Non-Visible Pollutant Monitoring Requirements

- a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.
- b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.
- c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.
- d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).
- f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.
- g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.⁶
- h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. Risk Level 2 – Watershed Monitoring Option

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program

⁶ For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. Risk Level 2 – Particle Size Analysis for Project Risk Justification

Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. Risk Level 2 – Records

Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

- a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.
- b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.
- c. The date and approximate time of analyses.
- d. The individual(s) who performed the analyses.
- e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.
- f. Rain gauge readings from site inspections;
- g. Quality assurance/quality control records and results.
- h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).
- i. Visual observation and sample collection exception records (see Section I.6 above).

- j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. Risk Level 2 – NAL Exceedance Report

- a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.
- b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.
- c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.
- d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:
 - i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).
 - ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
 - iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1 NTU		250 NTU
		For ATS discharges	1 NTU		N/A