Meeting of the Central Valley Flood Protection Board
June 28, 2013
Staff Report
California Department of Transportation, District 2
Salt Creek Bridge Widening, Shasta County

1.0 – ITEM

Consider approval of Permit No. 18858 (Attachment B)

2.0 – APPLICANT

California Department of Transportation (Caltrans), District 2

3.0 – LOCATION

The proposed project is located at the State Route 299 crossing of Salt Creek in Shasta County, northeast of the City of Redding (see Attachment A for Vicinity and Location Maps). Salt Creek is a tributary to Cow Creek, which is a tributary to the Sacramento River.

4.0 – PROJECT DESCRIPTION

Caltrans proposes to widen the existing Salt Creek Bridge (No. 06-0049) by 6 feet, 9 inches to provide 10-foot left and right shoulders for a total width of 47 feet, 6 inches. Construction includes 200 cubic yards of excavation of banks and channel bottom for abutments, revegetation, spread footings and columns, temporary structure supports, clear water diversions, coffer dams, and work mats.

5.0 – PROJECT ANALYSIS

5.1 – Authority of the Board

- California Code of Regulations, Title 23 (CCR 23), §6 – Need for a Permit; §112 – Streams Regulated and Nonpermissible Work Periods; §116 – Borrow and

Excavation; §120 – Levees; §121 – Erosion Control; §125 – Retaining Walls; §128 – Bridges; §130 – Vegetation

- The proposed bridge project would encroach upon Salt Creek in Shasta County, a Regulated Stream per CCR 23 §112, Table 8.1.

5.2 – Project Background

Caltrans proposes a safety project along State Route (SR) 299 in Shasta County. As part of the roadway project, the existing bridge will be widened to accommodate ten foot shoulders to improve roadway safety and increase sight distances in the vicinity of the bridge.

5.3 – Project Design

The existing bridge was constructed in 1968 and is 162 feet, four inches long and 34 feet, two inches wide. The existing bridge is a concrete slab structure on multi-column bents with one-foot, three-inch diameter reinforced concrete columns on spread footings.

The proposed widening would add approximately six foot, nine inches to the upstream and downstream bridge faces resulting in an overall width of 47 feet, six inches. This widening includes two new columns at each bent (one upstream and one downstream) on spread footings. The proposed columns will match the existing columns and the footings will be tied into the existing footings.

This project includes revegetation to replace vegetation lost during construction (see Attachment C). No additional vegetation will be added to the project area. As described in the Caltrans Revegetation Letter (Attachment D) all plantings will be replaced in kind to restore the site to conditions prior to construction, and will result in no net change to vegetation conditions or adverse impacts to channel / bridge hydraulics.

5.3.1 –Backfill Variance

Caltrans has previously requested for a variance based on CCR 23, § 11(b), which states:

“When approval of an encroachment requires a variance, the applicant must clearly state in the application why compliance with the board’s standards is infeasible or not appropriate.”

Caltrans' request is to vary from the backfill standard in CCR 23, §128(a)(1), which states:

"Any excavation within the levee section or near bridge supports within the floodway must be backfilled in four- (4) inch to six- (6) inch layers with approved material. The levee section must be compacted to a relative compaction of not less than ninety (90) percent per ASTM D1557-91, dated 1991, which is incorporated by reference and above optimum moisture content. Compaction within the floodway must be to the density of the adjacent undisturbed material."

Per Caltrans' previous requests they are proposing that the Board's standard is not appropriate, and are requesting to use Caltrans' Standard Specifications (2010) SS19-3.0E which allow up to 8-inch lift layers (see Exhibit B).

Staff has previously reviewed Caltrans' variance request and has determined that Caltrans' standard is suitable and more appropriate for this project than Board's standards and that the requested variance from CCR 23, §128(a)(1) will have no adverse affect on the Board's jurisdiction, the structural integrity of the bridge, or the channel.

Staff has therefore modified the language typically used for Special Condition THIRTY-FOUR of Draft Permit No. 18858 to reflect the proposed variance (see Attachment B).

5.4 – Hydraulic Analysis

Caltrans analyzed the hydraulic impacts using the HEC-RAS (version 4.1.0) modeling program. Based on U.S. Geological Survey (USGS) data the 100-year event was calculated to be 5,800 cubic feet per-second (cfs) for Salt Creek at the project location. This design flow yields a water surface elevation (WSE) at the bridge of approximately 575.7 feet (NAVD 88).

A channel roughness coefficient of 0.047 was used to model both pre- and post-project conditions based upon a channel slope of approximately 0.4% and USGS data. This is consistent with the project design to revegetate the site to restore existing vegetation in like, kind, and quantity due to construction impacts.

The minimum soffit elevation for the proposed bridge widening is 581.7 feet. This is approximately 0.10 feet lower than the existing soffit due to super-elevation of the

widened structure. Freeboard for the widened structure will be approximately 6 feet at the 100-year discharge.

The proposed widening results in an approximate rise in WSE of 0.03 feet, and a decrease in channel velocity of 0.04 feet-per-second due to the extra columns in the channel to support the widened structure.

5.4.1 –Scour

The project site is located on siltstone bedrock underlying the creek at shallow depths. Due to the shallow bedrock layer there is no historic evidence of scour at the project site, and the proposed bridge widening is not expected to introduce any scour issues.

Board staff has reviewed Caltrans' Hydraulics Report, and has concluded that the proposed project is hydraulically compliant with CCR 23, and would result in no significant adverse hydraulic impacts to Salt Creek.

5.5 – Geotechnical Analysis

Board staff has reviewed Caltrans' Foundation Plan and has concluded that the proposed project would result in no significant adverse geotechnical impacts to Salt Creek. Excavation within the floodway occurs at locations that are not critical to the integrity of the creek channel or banks.

All fill, excavation, and temporary structures will be completed in compliance with Draft Permit No. 18858 and CCR 23 standards.

6.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project from all pertinent agencies are as follows:

- The USACE comment letter has been received for this application. The USACE Sacramento District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project. The letter is incorporated it into the permit as Exhibit A.

7.0 –CEQA ANALYSIS

Board staff has prepared the following California Environmental Quality Act (CEQA) determination:

The Board, as a responsible agency under CEQA, has reviewed the Initial Study and Negative Declaration (IS/ND) (SCH Number: 2011072037, July 2011) for the Bella Diddy Roadway Rehabilitation Project prepared by the lead agency, Caltrans. These documents, including project design, may be viewed or downloaded from the Central Valley Flood Protection Board website at http://www.cvfpb.ca.gov/meetings/2013/6-28-2013.cfm under a link for this agenda item. These documents are also available for review in hard copy at the Board and the Caltrans offices.

Caltrans has determined that the project would have less than significant or no effect on the environment and filed a Notice of Determination with the State Clearinghouse on October 17, 2011. Board staff has independently reviewed the subject documents and finds that the proposed project will have no potentially significant effects on the environment.

8.0 – SECTION 8610.5 CONSIDERATIONS

- Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

  The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

- The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

  The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit.

- Effects of the decision on the facilities of the State Plan of Flood Control, and consistency of the proposed project with the Central Valley Flood Protection Plan as adopted by Board Resolution 2012-25 on June 29, 2012:

This project has no adverse effect on facilities of the State Plan of Flood Control and is consistent with the adopted 2012 Central Valley Flood Protection Plan.

- Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

  There are no foreseeable projected future events that would impact this project.

9.0 – STAFF RECOMMENDATION

Staff recommends that the Board:

- adopt the CEQA findings,
- approve the permit in substantially the form provided,
- and direct the Executive Officer to take the necessary actions to execute the permit, and file a Notice of Determination with the State Clearinghouse.

10.0 – LIST OF ATTACHMENTS

A. Vicinity and Location Maps
B. Draft Permit No. 18858
   Exhibit A: USACE Comment Letter (dated June 19, 2013)
   Exhibit B: Caltrans Standard Backfill Specifications
C. Project Design Plans
D. Caltrans Revegetation Letter (dated November 16, 2012)

Reviewed by:	Nancy Moricz, PE, Senior Engineer
Environmental Review:	James Herota, Staff Environmental Scientist
Document Review:	Eric Butler, PE, Projects and Environmental Branch Chief
	Len Marino, PE, Chief Engineer

Project Vicinity

Project Location

DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18858 BD

This Permit is issued to:

California Department of Transportation
1031 Butte Street Ste. 205
Redding, California 96001

To widen the existing Salt Creek Bridge (No. 06-0049) by 6 feet, 9 inches to provide 10-foot left and right shoulders for a total width of 47 feet, 6 inches. Construction includes 200 cubic yards of excavation of banks and channel bottom for abutments, revegetation, spread footings and columns, temporary structure supports, clear water diversions, coffer dams, and work mats.

The project is located at the State Route 299 crossing of Salt Creek in Shasta County. (Section 3, T32N, R3W, MDB&M, Salt Creek, Shasta County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

_____
Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to

change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18858 BD

THIRTEEN: All work completed under this permit, as directed by the general and special conditions herein, shall be accomplished to ensure that the work is not injurious to adopted plans of flood control, regulated streams, and designated floodways under Board jurisdiction, as defined in California Code of Regulations, Title 23. This permit only applies to the completion of work in the project description located within, or adjacent to and having bearing on Board jurisdiction, and which directly or indirectly affects the Board's jurisdiction. This special condition shall apply to all subsequent conditions herein.

LIABILITY AND INDEMNIFICATION

FOURTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board, the Department of Water Resources, and their respective officers, agents, employees, successors and assigns, safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The Central Valley Flood Control Board and the Department of Water Resources expressly reserve the right to supplement or take over their defense, in their sole discretion.

FIFTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board, the Department of Water Resources, and their respective officers, agents, employees, successors and assigns, safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The Central Valley Flood Control Board and the Department of Water Resources expressly reserve the right to supplement or take over their defense, in their sole discretion.

SIXTEEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the Central Valley Flood Protection Board, the Department of Water Resources, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim. This condition shall supersede condition TEN, above.

SEVENTEEN: The Central Valley Flood Protection Board and the Department of Water Resources shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from reservoirs, flood fight, operation, maintenance, inspection, or emergency repair.

PERMITTING AND AGENCY CONDITIONS

EIGHTEEN: The letter from the U.S. Army Corps of Engineers, Sacramento District, dated June 19, 2013 is attached to this permit as Exhibit A in reference to this project.

NINETEEN: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

TWENTY: If the permittee does not comply with the conditions of this permit and enforcement by the Board is required, the permittee shall be responsible for bearing all costs associated with the enforcement action, including reasonable attorney's fees.

TWENTY-ONE: The permittee shall be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

TWENTY-TWO: The permittee agrees to incur all costs for compliance with local, State, and federal permitting and resolve conflicts between any of the terms and conditions that agencies might impose under the laws and regulations it administers and enforces.

PRE-CONSTRUCTION

TWENTY-THREE: The permittee shall contact the Central Valley Flood Protection Board by telephone at (916) 574-0609 to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY-FOUR: Thirty (30) calendar days prior to start of any demolition and/or construction activities within the channel and banks of Salt Creek, the permittee shall submit to the Chief Engineer two sets of plans, specifications and supporting geotechnical and / or hydraulic impact analyses, for any and all temporary, in channel cofferdam(s), gravel work pad(s), work trestle(s), scaffolding, piles, and/or other appurtenances that are to remain in the floodway during the flood season from November 1 through April 15. The Central Valley Flood Protection Board shall acknowledge receipt of this submittal in writing within ten (10) working days of receipt, and shall work with the permittee to review and respond to the request as quickly as possible. Time is of the essence. The Central Valley

Flood Protection Board may request additional information as needed and will seek comment from the U.S. Army Corps of Engineers and / or local maintaining agency when necessary. The Central Valley Flood Protection Board will provide written notification to the permittee if the review period is likely to exceed thirty (30) calendar days.

TWENTY-FIVE: Prior to commencement of work, the permittee shall create a photo record, including associated descriptions of project conditions. The photo record shall be certified (signed and stamped) by a licensed land surveyor or professional engineer in the State of California and submitted to the Central Valley Flood Protection Board within thirty (30) calendar days of beginning the project.

TWENTY-SIX: All addenda or other changes made to the submitted documents by the permittee after issuance of this permit shall be submitted to the Chief Engineer for review and approval prior to incorporation into the permitted project. The submittal shall include supplemental plans, specifications, and supporting geotechnical, hydrology and hydraulics, or other technical analyses. The Central Valley Flood Protection Board shall acknowledge receipt of the addendum or change submittal in writing within ten (10) working days of receipt, and shall work with the permittee to review and respond to the request as quickly as possible. Time is of the essence. The Central Valley Flood Protection Board may request additional information as needed and will seek comment from the U.S. Army Corps of Engineers and / or local maintaining agency when necessary. The Central Valley Flood Protection Board will provide written notification to the permittee if the review period is likely to exceed thirty (30) calendar days. Upon approval of submitted documents the permit shall be revised, if needed, prior to construction related to the proposed changes.

TWENTY-SEVEN: The permittee shall provide construction supervision and inspection services acceptable to the Central Valley Flood Protection Board. A professional engineer registered in the State of California shall certify that all work was inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

CONSTRUCTION

TWENTY-EIGHT: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No work, other than that approved by this permit, shall be done in the project area without prior approval of the Central Valley Flood Protection Board.

TWENTY-NINE: No construction work of any kind shall be done during the flood season from November 1st to April 15th without prior approval of the Central Valley Flood Protection Board.

THIRTY: No material stockpiles, temporary buildings, or equipment shall remain in the floodway during the flood season from November 1 to April 15.

THIRTY-ONE: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to April 15.

THIRTY-TWO: All debris generated by this project shall be disposed outside of the channel and banks of Salt Creek.

THIRTY-THREE: Fill material shall be placed only within the area indicated on the approved plans.

THIRTY-FOUR: Backfill material for excavations shall be placed in up to 8-inch layers and compacted with material as specified in CalTrans Standard Specifications (2010) SS19-3.0E to the density also specified, which is attached to this permit as Exhibit B and is incorporated by reference.

THIRTY-FIVE: Density tests by a certified materials laboratory will be required to verify compaction of backfill within the creek.

THIRTY-SIX: In the event existing revetment on the creek bank is disturbed or displaced, it shall be restored to its original condition or brought to a higher standard, to the satisfaction of Board staff, upon completion of the proposed work.

THIRTY-SEVEN: Except with respect to the activities expressly allowed under this permit, the work area shall be restored to the condition that existed prior to start of work.

THIRTY-EIGHT: The permittee shall be responsible for all damages due to settlement, consolidation, or heave from any construction-induced activities.

VEGETATION / ENVIRONMENTAL MITIGATION

THIRTY-NINE: FIll placed at slopes greater than 2 horizontal to 1 vertical shall be seeded with a native grass mix to reduce the risk of erosion.

FORTY: Any vegetative material, living or dead, that interferes with the successful execution, functioning, maintenance, or operation of the adopted plan of flood control must be removed by the permittee at permittee's expense upon request by the Central Valley Flood Protection Board, Department of Water Resources, or local maintaining agency. If the permittee does not remove such vegetation or trees upon request, the Central Valley Flood Protection Board reserves the right to remove such at the permittee's expense.

POST-CONSTRUCTION

FORTY-ONE: The permittee shall be responsible for repair of any damages to the Salt Creek channel and banks due to construction, operation, or maintenance of the proposed project.

FORTY-TWO: Upon completion of the project, the permittee shall submit a final completion letter to the Central Valley Flood Protection Board, 3310 El Camino Avenue, Suite 164, Sacramento, California 95821, and to the Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite 256, Sacramento, California 95821.

FORTY-THREE: Within 120 days of completion of the project, the permittee shall submit to the Central Valley Flood Protection Board as-built drawings and a certification report, stamped and signed by a civil engineer registered in the State of California, certifying the work was performed and inspected in accordance with the Central Valley Flood Protection Board permit conditions and submitted drawings and specifications.

OPERATIONS AND MAINTENANCE

FORTY-FOUR: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Central Valley Flood Protection Board, Department of Water Resources, or any other agency responsible for maintenance.

FORTY-FIVE: If the bridge is damaged to the extent that it may impair the channel or floodway capacity, it shall be repaired or removed prior to the next flood season.

FORTY-SIX: Drainage from the bridge or highway shall not be discharged directly into Salt Creek without proper erosion control measures in-place.

FORTY-SEVEN: If the permitted structure results in any adverse hydraulic impact or scouring the permittee shall provide appropriate mitigation measures subject to review and approval of the Central Valley Flood Protection Board.

FORTY-EIGHT: All debris that may accumulate around the bridge piers and abutments within Salt Creek shall be completely removed from the floodway following each flood season.

FORTY-NINE: If erosion occurs adjacent to the permitted encroachment(s), the permittee shall repair the eroded areas and place adequate revetment on the affected areas to prevent further erosion.

FIFTY: The permitted encroachment(s) shall not interfere with the flood conveyance capability of the Salt Creek channel. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s) under direction of the Central Valley Flood Protection Board or Department of Water Resources. If the permittee does not comply, the Central Valley Flood Protection Board may modify or remove the encroachment(s) at the permittee's expense.

FIFTY-ONE: At the request of either the permittee or Central Valley Flood Protection Board the permittee and Board shall conduct joint inspections of the project and channel after significant flood events or flood seasons to assess the integrity and operation of the project, and to assess and respond to any adverse impacts on the channel or adjacent properties.

PROJECT ABANDONMENT, CHANGE IN PLAN OF FLOOD CONTROL

FIFTY-TWO: If the project, or any portion thereof, is to be abandoned in the future, the permittee shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's cost and expense.

FIFTY-THREE: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

END OF CONDITIONS

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

REPLY TO
ATTENTION OF

Flood Protection and Navigation Section (18858)

JUN 19 2013

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

We have reviewed a permit application by the California Department of Transportation (application number 18858). This project includes widening the existing Salt Creek Bridge (No. 06-0049) and excavation 125 cubic yards of banks and channel bottom. The project is located at the Highway 299 crossing of Salt Creek, at 40.6611°N 122.1959°W NAD83, Shasta County, California.

The District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project.

A Section 10 and/or Section 404 permit application (2011-00424) is in process for this work.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite LL30, Sacramento, CA 95821.

Sincerely,

for Meegan G. Nagy, P.E.
Chief, Flood Protection and Navigation Section

California Test 216
October 2006

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
Transportation Laboratory
5900 Folsom Boulevard
Sacramento, California 95819-4612

METHOD OF TEST FOR RELATIVE COMPACTION OF UNTREATED AND TREATED SOILS AND AGGREGATES

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read "**SAFETY AND HEALTH**" in Section K of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. GENERAL SCOPE

This method of test shall be used to determine the relative compaction of untreated and treated soils and aggregates.

Relative compaction in this method is defined as the ratio of the in-place wet density of a soil or aggregate to the test maximum wet density of the same soil or aggregate when compacted by a specific test method.

The in-place, wet density shall be determined in accordance with Part 1 of this method of test.

The laboratory test maximum wet density and percent relative compaction shall be determined in accordance with Part 2 of this method of test.

PART 1. IN-PLACE WET DENSITY

A. SCOPE

The principal use of the in-place wet density value is in the relative compaction control of earthwork construction; however, the identical procedure and apparatus are also employed to obtain data for volume-to-weight conversion factors and shrinkage or swell factors. The determination of the in-place wet density requires excavating and weighing a sample of soil from the area under investigation, measuring the volume of the sample excavation by back-filling with a calibrated test sand, and calculating the unit wet weight of the excavated sample.

B. TEST PROCEDURE

This test shall be done in accordance with AASHTO T 191, "Density of Soil In-Place by the Sand-Cone Method."

NOTE: Typically, the test hole excavation alone will not provide a sufficient volume of material required for completion of Part 2 of this test method. Therefore, it is necessary to obtain a bulk sample of soil immediately adjacent to the excavated test hole following the completion of the sand volume measurement.

C. RECORDING DATA

The block headed "Sand Volume Data" on the Relative Compaction Test Worksheet provides for the data accumulated at the in-place test hole site.

PART 2. LABORATORY COMPACTED TEST MAXIMUM WET DENSITY AND PERCENT RELATIVE COMPACTION

A. SCOPE

A bulk sample of soil is divided into smaller portions. These portions are prepared with varying moisture contents

to form test specimens, which are individually compacted by a uniform compactive effort, to determine the test maximum density for the particular soil under consideration.

NOTE: The test maximum density determination and percent relative compaction for Class A CTB is determined according to California Test 312.

B. APPARATUS

1. The standard California impact compaction test apparatus consisting of a split cylindrical mold, a 10.0 lb tamper, a metal piston, and a piston-handling rod, as illustrated in Attachment 1. (Note: see CTM 110 for calibration.)

2. A concrete base block, or an equally rigid body, approximately 1 cubic foot in size.

3. A balance or scale of at least 3 kg capacity and sensitive to 1 g.

4. Miscellaneous mixing bowls, spoons and spatulas, five moisture-sealed containers (approximately 1 gallon capacity) to be used to store each specimen and five moisture-sealed containers (approximately ¼ gallon capacity) to be used to store each portion of a specimen.

C. BULK SAMPLE

Obtain a bulk sample of soil, 35 lbs minimum in weight, at the site of the in-place density test hole. It is essential that the bulk sample be preserved at the same moisture as prevailed at the time of excavation for the duration of the test. Use only moisture-proof containers and protect from high temperatures.

D. PREPARATION OF TEST SPECIMENS

1. Separate the bulk sample on the ¾-inch sieve, and weigh both the retained and passing fractions and compute the percentage retained in terms of wet weight of the total bulk sample. If 10 % or more of the total weight is retained on ¾-inch sieve, follow the test procedure set forth in Section I of this Part 2. If the retained ¾-inch fraction comprises less than 10 % by weight of the total bulk sample, discard it and divide the passing ¾-inch fraction into representative test specimens of exactly equal weight, each sufficient in amount to form a compacted test specimen of 10 to 12 inches in height when compacted as specified in the following section E.

2. It is of the utmost importance that all of the bulk sample material be thoroughly mixed. Each test specimen must be representative of the mass, be of equal weight, be weighed in immediate succession, and be placed at once in the one-gallon moisture-sealed individual containers.

3. The correct weight for each test specimen will depend on the soil type and the moisture content; 2200 to 2700 grams wet weight is the usual range of weight.

4. Record the initial weight of the individual test specimens on line “I” of the Relative Compaction Test Worksheet.

E. COMPACTION OF TEST SPECIMENS

1. Divide one of the test specimens prepared as outlined in the foregoing Section D into five approximately equal portions by either weight or volume measurement, and store in separate ¼-gallon moisture-sealed containers. Place one portion in the test mold and compact it with 20 blows of the tamper dropping free from a height of 18 inches above the surface of the material in the mold. Repeat this operation for each of the remaining four portions. After the compaction of the fifth portion, place the piston in the mold and level the top of the compacted specimen with five blows of the tamper dropping free

from a height of 18 inches above the surface of the piston.

2. With the tamper foot resting on the piston atop the compacted test specimen, read the graduated tamper shaft to the nearest graduation at a point level with the top of the mold. Enter this value on line "J."

3. Obtain the adjusted wet density in grams per cubic centimeter from Table 1 corresponding to the tamper shaft graduation reading using the column corresponding to the initial wet weight of test specimen (line "I") and record it on line "K."

4. Save the specimen temporarily for possible later use. (See the first paragraph of Section G of this Part 2).

5. Adjust the moisture contents of the remaining test specimens to satisfy the following conditions:

   a. The object is to have at least one test specimen with a moisture content below test optimum, one close to optimum and one above optimum, at about 2 % moisture content increments, with a minimum of three test specimens. While the actual moisture contents will not be known, the moisture content of the test specimen with the highest adjusted wet density is the test optimum moisture content even though the moisture content is unknown. Therefore, the primary objective is to have a number of test specimens and a range of moisture contents such that at least one specimen will be compacted at a moisture content less than, and one at a moisture content greater than, the moisture content of the specimen having the highest adjusted wet density. If this condition cannot be satisfied with the minimum three test specimens it will be necessary to fabricate additional specimens.

   b. The first test specimen is generally compacted at the moisture content present in the bulk sample. If this specimen appears to be considerably drier than the optimum, mix additional water into each of the remaining specimens. If it appears to be definitely wetter than the optimum, reduce the moisture content of the other specimens by aeration. Partial oven drying may be used, but do not completely oven-dry the specimens and then remix with water. If it appears to be close to the optimum, increase the moisture content of one of the remaining test specimens and reduce it in the other one to bracket the initial specimen thought to be at optimum.

   c. The test optimum moisture content will usually be the minimum moisture content which will ball the soil readily when compressed into a roll by the grip of the hand, but still permit the roll to be broken without crumbling or pulverizing appreciably at the breaking point.

   d. The base plate of the test mold normally shows indications of dampness when a soil is compacted at the test optimum moisture content. Free water on the base plate definitely denotes excessive moisture content. A dry, dusty base plate signifies a deficiency of water.

6. After adjustment of the moisture content, compact each of the remaining test specimens in the mold, then record the water adjustment, tamper reading and the corresponding adjusted wet density from the chart on Table 1 using the column corresponding to the initial wet weight (line "I").

7. Regardless of the soil type or particle sizes involved, fresh soil (not soil

from previously compacted specimens) must be used in the compaction of each test specimen. The compactive effort being equal for each layer, it is also important that the thickness of layers be equal to assure uniformity of compaction between test specimens.

8. Throughout the compacting operation the test mold must stand either on the standard concrete base block or on an equally rigid body.

9. In reassembling the test mold after removing a core, the wing nut should be drawn up only finger tight. The purpose of the wrench is to release the wing nuts when locked by expansive soils in the mold. Excessive tightening of the nuts distorts the circular cross-section of the mold. In gauging the 18-inch height of fall for the tamper, the hook and rod arrangement, shown in Attachment 1, should be used.

F. COMPUTATION OF RELATIVE COMPACTION

Compute the percent relative compaction to the nearest 0.1 % by the formula:

% Relative Compaction = $(D_1/D_2) \times 100$

Where:

D_1 = In-place wet density as shown on line "H."
D_2 = Highest adjusted wet density as determined by this method.

For reporting and specification compliance purposes, show the percent relative compaction as a whole number. If the computed value ends in a number with a fractional portion of 0.5 % or greater, report the relative compaction as the next higher whole number. If the computed value ends in a number with a fractional portion of less than 0.5 %, report it without changing the whole number.

Attachment 3 presents an example of a properly completed Relative Compaction Test Worksheet.

G. MOISTURE CONTENTS

The moisture content of the specimen with the highest adjusted wet density is the optimum moisture. The moisture content of the specimen compacted without addition or reduction of water will represent the in-place moisture content of the soil at the test site. If either moisture content is desired, the determination is made in accordance with California Test 226. Once the moisture contents are determined, percent relative compaction can also be determined by relating dry in-place density to dry test maximum density.

Provision is made at the bottom of the Relative Compaction Test Worksheet for determination of the Moisture Adjustment for Aggregate Base Pay Quantities, if desired.

H. MOISTURE-DENSITY CURVE

A moisture-density curve may be formed by plotting the adjusted wet density versus change in grams of water added or subtracted in adjusting the moisture contents of the test specimens. The sample curve appearing on Attachment 3 was plotted from the data presented on line "K" and the "Water Adjustment" line.

The highest point on the curve represents the maximum density, in this instance 2.14 at 0 grams of water ("0 grams" thus means in-place moisture content at test site is optimum moisture).

I. CORRECTION FOR OVERSIZE MATERIAL

1. The diameter of the test mold limits the size of particles that may be included in the test to that passing ¾-nch sieve. In those instances where the original material from which the test specimens are obtained contains 10 % or more by weight of particles retained on the ¾-inch sieve,

a correction must be applied to the test.

The density correction is calculated by the following:

$$\text{Corrected Density} = \frac{100}{\frac{\%\ -3/4\ \text{inch}}{G_1} + \frac{\%\ +3/4\ \text{inch}}{YG_2}}$$

G_1 = Specific gravity of – 3/4 inch material
G_2 = Specific gravity of +3/4 inch material
Y = Coefficient for +3/4 inch aggregate

% +3/4 inch	Y
20 or less	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

2. Record the total weight of bulk sample on line "L."

3. Separate the bulk sample on the ¾-inch sieve, wash the retained ¾-inch material, remove excess surface water by rolling sample in a large, absorbent cloth. Weigh in air and record on line "M."

1. Weigh the retained ¾-inch fraction in water and record on line "N."

5. The impact test is performed on the passing ¾-inch fraction as outlined in Sections C through E of this Part 2.

6. The remainder of the calculations necessary to compensate for the retained ¾-inch material and to determine percent relative compaction is shown on lines "O" through "V."

7. When a number of tests on soil containing essentially the same nature of retained ¾-inch material are anticipated, a constant may be developed to minimize the weighing in air and water operations.

J. SIMPLIFICATIONS FOR CONSTRUCTION CONTROL

Construction control by wet density tests may be expedited. If the relative compaction based on any test specimen density is below the specified minimum it may be immediately reported that the area under test has failed to meet the specifications. It is not necessary to fabricate additional test cores for the reason that if a higher wet density was reached with subsequent test cores the relative compaction based on this higher density would be still lower than that indicated by the single core. When the relative compaction indicated by a single test core is more than the minimum specified, additional cores are necessary to be certain that any increase in wet test maximum density attained with the subsequent cores does not lower the relative compaction value to below the specification minimum.

K. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste material, testers are required to read Part A, (Section 5.0), Part B, (Section 5.0, 6.0, 10), and Part C, (Section 1.0) of Caltrans Laboratory Safety Manual.

REFERENCES
California Tests 231, 312, 226 and 110
ASTM D 1556

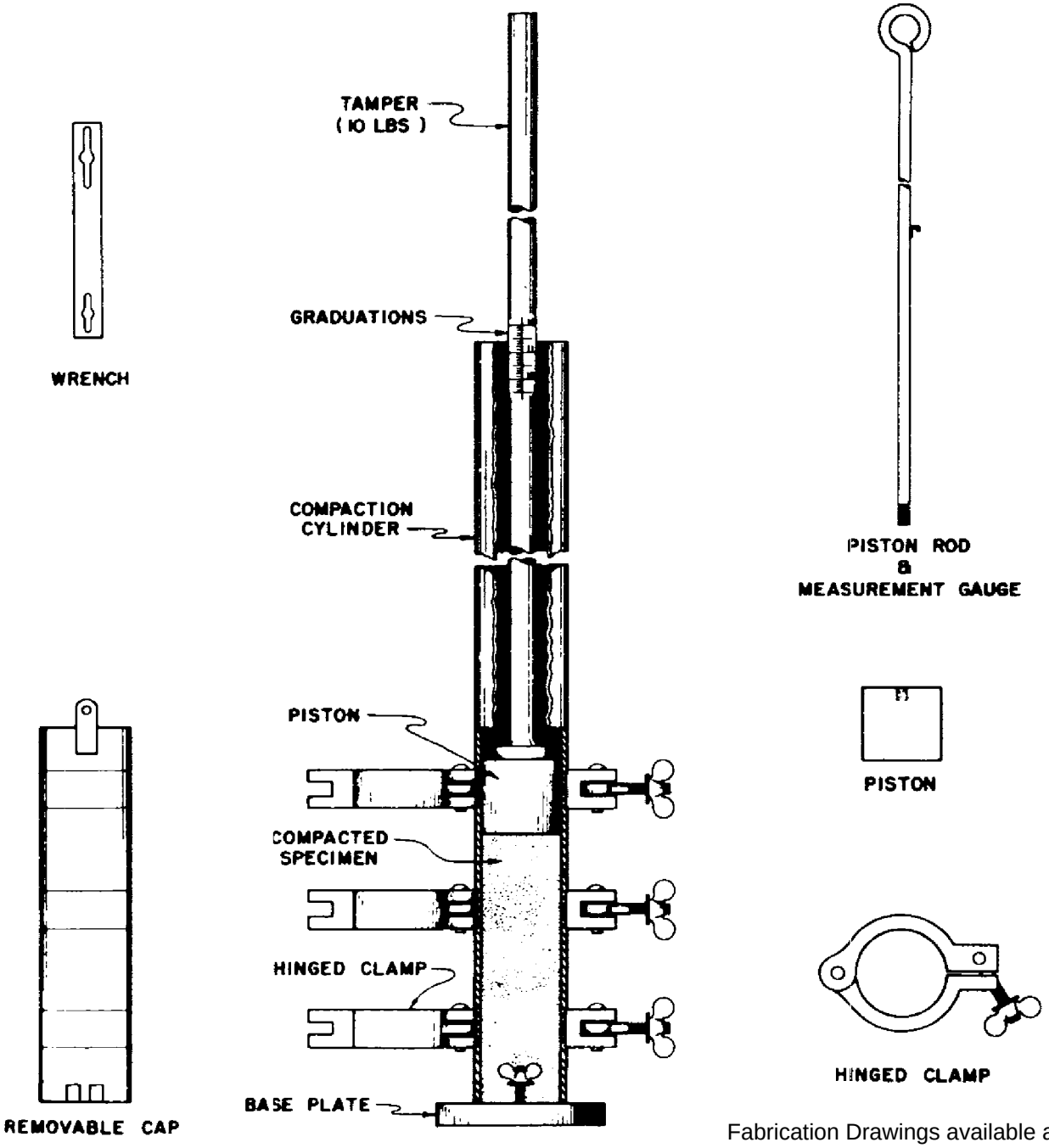
End of Text
(California Test 216 contains 9 pages)

TABLE 1
CALIFORNIA IMPACT TEST APPARATUS CONVERSION TABLE

Tamper Reading to Grams per Cubic Centimeter for Impact Test Core Weights

Tamper Reading	Weight of Test Core (g)										
	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700
10	2.09	2.13	2.18	2.23	2.27	2.32	2.37	2.42	2.46	2.51	2.56
10.1	2.06	2.11	2.16	2.21	2.25	2.30	2.35	2.39	2.44	2.49	2.53
10.2	2.04	2.09	2.14	2.18	2.23	2.28	2.32	2.37	2.42	2.46	2.51
10.3	2.02	2.07	2.12	2.16	2.21	2.25	2.30	2.35	2.39	2.44	2.48
10.4	2.01	2.05	2.10	2.14	2.19	2.23	2.28	2.32	2.37	2.42	2.46
10.5	1.99	2.03	2.08	2.12	2.17	2.21	2.26	2.30	2.35	2.39	2.44
10.6	1.97	2.01	2.06	2.10	2.15	2.19	2.24	2.28	2.33	2.37	2.41
10.7	1.95	1.99	2.04	2.08	2.13	2.17	2.21	2.26	2.30	2.35	2.39
10.8	1.93	1.97	2.02	2.06	2.11	2.15	2.19	2.24	2.28	2.33	2.37
10.9	1.91	1.96	2.00	2.04	2.09	2.13	2.17	2.22	2.26	2.30	2.35
11	1.90	1.94	1.98	2.03	2.07	2.11	2.15	2.20	2.24	2.28	2.33
11.1	1.88	1.92	1.96	2.01	2.05	2.09	2.13	2.18	2.22	2.26	2.31
11.2	1.86	1.90	1.95	1.99	2.03	2.07	2.12	2.16	2.20	2.24	2.29
11.3	1.85	1.89	1.93	1.97	2.01	2.06	2.10	2.14	2.18	2.22	2.26
11.4	1.83	1.87	1.91	1.95	2.00	2.04	2.08	2.12	2.16	2.20	2.25
11.5	1.81	1.85	1.90	1.94	1.98	2.02	2.06	2.10	2.14	2.18	2.23
11.6	1.80	1.84	1.88	1.92	1.96	2.00	2.04	2.08	2.12	2.17	2.21
11.7	1.78	1.82	1.86	1.90	1.94	1.98	2.03	2.07	2.11	2.15	2.19
11.8	1.77	1.81	1.85	1.89	1.93	1.97	2.01	2.05	2.09	2.13	2.17
11.9	1.75	1.79	1.83	1.87	1.91	1.95	1.99	2.03	2.07	2.11	2.15
12	1.74	1.78	1.82	1.86	1.90	1.94	1.97	2.01	2.05	2.09	2.13

CALIFORNIA IMPACT COMPACTION APPARATUS



Fabrication Drawings available at:

Transportation Laboratory
5900 Folsom Blvd
Sacramento, CA 95819
916-227-7000

ATTACHMENT 1

California Test 216
October 2006

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

RELATIVE COMPACTION TEST

TL-297 (REV 10/2005)

Job Stamp	Location	Test No.
	Material	From
	Impact by	Sand Vol. By
	Date	Date

	SAND VOLUME DATA	
A	Initial Wt. of Sand (g)	
B	Wt. of Residue (g)	
C	Wt. of Sand Used (A-B)	
D	Cone Correction (g)	
E	Wt. of Sand in Hole (C-D)	
F	Sand Density (g/cc)	
G	Volume of Hole (E/F)	
H	Wet Density (g/cc) (L/G)	

Remarks:

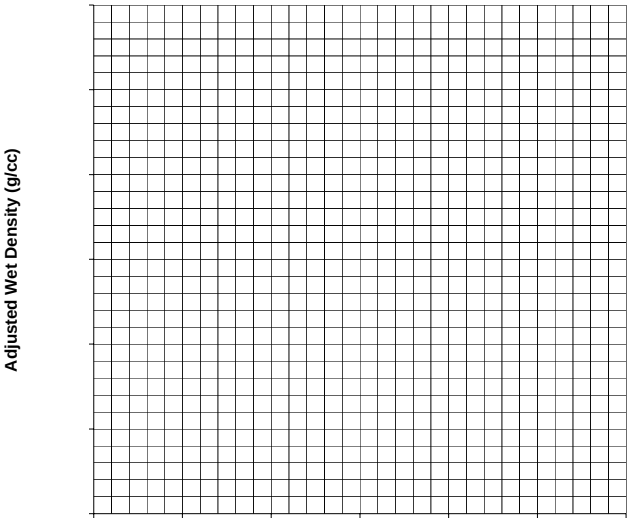
IMPACT TEST DATA

I	Initial Wet Weight of Test Specimen (g)				
	Increment	1	2	3	4
	Water Adjustment (g)				
J	Tamper Reading				
K	Adjusted Wet Density (g/cc)				

	ROCK CORRECTION		
L	Total Sample Weight	(g)	
M	+ 3/4-inch Weight in Air	(g)	
N	+3/4-inch Weight in Water	(g)	
O	+3/4-inch Volume	(M - N)	
P	% +3/4-inch	100 * (M / L)	
Q	% -3/4-inch	100 - P	
R	Density of +3/4-inch	(M / O)	
S	(%+3/4-inch) / Density of +3/4-inch	(P / RY)	
T	(%-3/4-inch) / Density of -3/4-inch	(Q / K)	
U	Sum of S and T	(S + T)	
V	Average Adjusted Wet Density	(100 / U)	

Percent Relative Compaction*	Spec	
		Failed or less
		Passed

*(H / K) for 10% or less +3/4-inch; (H / V) for > 10% +3/4-inch



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY

a	In-place Wet wt.		e	Test Spec. Wet Wt. (opt.)	
b	In-place Dry wt.		f	Test Spec. Dry Wt.	
c	In-place Water (a - b)		g	Test Spec. Water (e - f)	
d	In-place % Water (c / b)		h	Test Spec. % Water (g / f)	

Moisture Corr. (h + 1%) - d =

Moisture Corr. in excess of Opt. + 1% | % Moisture by CTM 226

+ 3/4-inch Aggregate Adjustment (Y)

% + 3/4-inch (P)	Adjustment
20 or less	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

ATTACHMENT 2

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

RELATIVE COMPACTION TEST

TL-297 (REV 10/2005)

Job Stamp	Location	Test No.
	Material	From
	Impact by	Sand Vol. By
	Date	Date

SAND VOLUME DATA		
A	Initial Wt. of Sand (g)	11250
B	Wt. of Residue (g)	1429
C	Wt. of Sand Used (A-B)	9821
D	Cone Correction (g)	1641
E	Wt. of Sand in Hole (C-D)	8180
F	Sand Density (g/cc)	1.55
G	Volume of Hole (cc) (E/F)	5277
H	Wet Density (g/cc) (L/G)	2.06

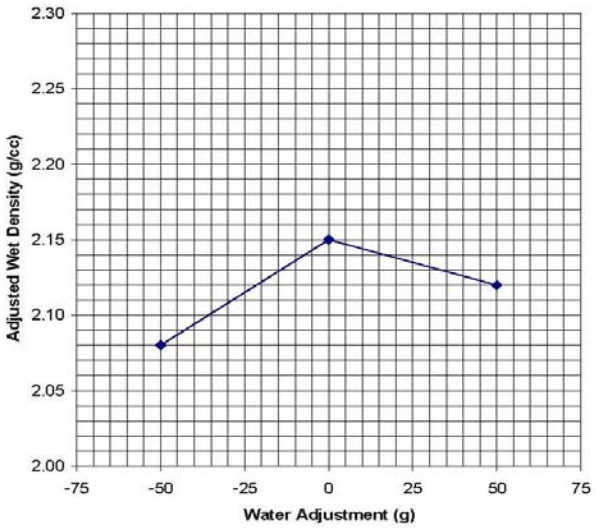
Remarks:

IMPACT TEST DATA					
I	Initial Wet Weight of Test Specimen (g)	2500			
	Increment	1	2	3	4
	Water Adjustment (g)	-50	0	50	
J	Tamper Reading	11.4	11.0	11.2	
K	Adjusted Wet Density (g/cc)	2.08	2.15	2.12	

ROCK CORRECTION			
L	Total Sample Weight	(g)	10865
M	+3/4-inch Weight in Air	(g)	3568
N	+3/4-inch Weight in Water	(g)	2322
O	+3/4-inch Volume	(M - N)	1246
P	% +3/4-inch	100 * (M / L)	32.8
Q	% -3/4-inch	100 - P	67.2
R	Density of +3/4-inch	(M / O)	2.86
S	(%+3/4-inch) / Density of +3/4-inch	(P / RY)	11.8
T	(%-3/4-inch) / Density of -3/4-inch	(Q / K)	31.3
U	Sum of S and T	(S + T)	43.1
V	Average Adjusted Wet Density	(100 / U)	2.32

Percent Relative Compaction*	Spec	Failed 89 or less
	90	Passed

*(H / K) for 10% or less +3/4-inch; (H / V) for > 10% +3/4-inch



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY					
a	In-place Wet wt.		e	Test Spec. Wet Wt. (opt.)	
b	In-place Dry wt.		f	Test Spec. Dry Wt.	
c	In-place Water (a - b)		g	Test Spec. Water (e - f)	
d	In-place % Water (c / b)		h	Test Spec. % Water (g / f)	
Moisture Corr. (h + 1%) - d =					
Moisture Corr. in excess of Opt. + 1%				% Moisture by CTM 226	

+ 3/4-inch Aggregate Adjustment (Y)

% + 3/4-inch (P)	Adjustment
20 or less	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

ATTACHMENT 3

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

California Test 231
April 2000

DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
Office of Materials Engineering and Testing Services
5900 Folsom Blvd.
Sacramento, California 95819-4612

METHOD OF TEST FOR RELATIVE COMPACTION OF UNTREATED AND TREATED SOILS AND AGGREGATES BY THE AREA CONCEPT UTILIZING NUCLEAR GAGES

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read "**SAFETY AND HEALTH**" in Part III of this method. It is the responsibility of whoever uses this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

OVERVIEW

This test method provides a procedure for selecting a test area, for determining the in-place wet density and moisture of untreated and treated soils and aggregates by the use of a nuclear gage, and for determining relative compaction. Wet density measurements are made in the direct transmission position where the rod is placed into the ground.

Select a direct transmission depth as close as possible to, but not equal to or greater than, the thickness of material being tested, i.e., use a 75 mm direct transmission depth and corresponding calibration to test a layer of material 100 mm thick, and use a 125 mm direct transmission depth and corresponding calibration to a test a layer of material 150 mm thick.

The laboratory wet test maximum density shall be determined as specified in California Test 312 for Class A Cement Treated Base; and as specified in California Test 216 for untreated materials, Class B cement treated base and lime treated soils and aggregates. On the basis of specified acceptance criteria, the relative compaction values are then used to determine the compliance or noncompliance of compaction specifications within the designated area. All calculations are based on wet relationships and are made in the metric system.

NOTE: See California Test 121 of the Manual of Test, Administrative Instructions, regarding use of nuclear gages.

This test method (231) is divided into the following parts:

I. Method of field determination of in-place wet density and moisture.

II. Method of applying the area concept and determining percent relative compaction.

III. Safety and Health

PART I. METHOD OF FIELD DETERMINATION OF IN-PLACE WET DENSITY AND MOISTURE

A. APPARATUS

1. Nuclear gage and standardizing block.

2. Miscellaneous tools such as trowels, scrapers, sieve, etc. for site preparation.

3. Guide plate, approximately 300 x 460 x 6 mm.

4. Pin, approximately 20 mm diameter x 600 mm long.

B. STANDARDIZATION OF NUCLEAR GAGE FOR WET DENSITY AND MOISTURE

1. Set the standardizing block 1.5 m from any object and 8 m from any other nuclear gage. Place the gage on the standardizing block in the closed (safe) position and take four (4) 1-min density counts. Repeat the four 1-min counts for moisture in the safe position. Record on Form TL 2148 (Figure 1) and in the gage logbook. When the nuclear gage is equipped with electronic circuitry capable of automatically averaging four one-minute density and moisture standard counts simultaneously, place the gage on the standardizing block in the closed (safe) position and take the average of the four one-minute counts. Record the density and moisture standard count averages on Form TL 2148 and in the gage logbook. For additional gage operation information not covered in this paragraph, follow instructions given in the manufacturer's manual.

2. The average of the four one-minute counts determined in C.1 is to be within ±ADL (see note) of the value used to establish the calibration table.

   If it is not, contact the Radiation Safety Officer who will establish a new standard count or have the gage sent in to be checked and/or repaired. Perform the standard count *at least* once during every 8 h of operation.

   NOTE: The acceptable deviation limit (ADL) is defined in this test method as $ADL = \sqrt{n}$ where n = number of counts indicated on the gage. This relationship is valid when the number of counts is over 10,000. Table 1 shows values of ADL for various counts.

C. SITE PREPARATION

1. Remove all loose surface material and prepare a plane surface large enough to seat the gage. Where sheepsfoot and similar type tamping rollers have been used, remove the loose surface material to a depth of not less than 50 mm below the deepest penetration by the roller. After the surface has been prepared to a flatness and smoothness within 3 mm, use a No. 4 (4.7 mm) or smaller sieve to obtain native fines to fill minor depressions, protrusions or to correct slight lack of plane. Tamp fines and any loosened material with the guide plate.

2. Make a hole using the pin and guide plate. Extract the pin with a pin puller. A drill may be used in lieu of the pin. The depth of hole shall be 50 mm greater than the transmission depth being used. This hole must be as close as possible to 90 degrees from the plane surface. If the plate is rotated slightly around the pin and the plate does not make contact with the ground, or if it appears that the hole is crooked, make a new hole.

D. FIELD TEST FOR DENSITY DETERMINATION

1. Place the nuclear gage on the prepared surface so that the bottom of the gage is firmly seated in contact with the soil. Insert the rod into the hole to the predetermined depth. Adjust the gage so that the rod is firmly against the side of the hole that is nearest to the gage.

   Obtain a 1-min reading. Record the data as shown on Figure 1.

2. Average counts from all test sites and determine count ratio by dividing the average field count by the average standard count.

3. Find the average count ratio and corresponding direct transmission average wet density (kg/m3) on the table supplied with the gage (Example Table 2). Record the data on Figure 1.

   NOTE: No obstruction or foreign element should be within a distance of 200 mm on both sides of the *source-detector axis.* Density calibration tables for the various depths are determined in accordance with California Test 111.

E. FIELD TEST FOR MOISTURE

This test is used for cases where moistures are desired or when common composite test maximum densities are used (Part II, F).

1. Obtain a standard count for moisture as specified in Section C of this Part I.

2. For site preparation, use procedure in Section D.1 of this Part I.

3. Place the gage on the prepared surface and take a 1-min moisture count. Record the data on Figure 1.

4. Determine a count ratio by dividing the field count by the moisture standard count.

5. Find the count ratio and corresponding moisture (kg/m3) from the table supplied with the gage (Example Table 3)

   NOTE: No obstruction or foreign element should be within a distance of 250 mm *from the side of the gage.* Moisture calibration tables are determined in accordance with California Test 111.

PART II. METHOD OF APPLYING THE AREA CONCEPT AND DETERMINING PERCENT RELATIVE COMPACTION

A. SCOPE

This is a statistical procedure where a number of test measurements are taken to evaluate the state of compaction of a selected area.

B. NUMBER AND LOCATION OF NUCLEAR TESTS

1. The area concept will be used with this test. The engineer will determine from a series of density tests whether to accept or reject a designated area. The engineer shall determine the area by inspection, based on uniformity of factors affecting compaction. Insofar as possible, the area designated shall be generally homogeneous for both character of material and conditions of production and compaction. Portions of the area, which may be observed or suspected to be different from the area as a whole, will be excluded from the test. If a relative compaction test is desired for these different portions, they shall be designated as a separate test area or areas and tested separately. Do not designate test areas which include: (1) materials from separate sources, unless such materials were intermixed during placing of the compacted area; (2) materials which were placed and compacted by different types of operations or processes; or (3) material placed during different periods of production or in nonadjacent areas.

2. Select a *minimum* of 5 test sites for areas 800 m^2 or more by using a set of 10 random sample plans (Figure 3). Follow instructions given in Figure 3.

   Obtain nuclear counts at all test sites and average all counts for the area (Figure 1). If the designated test area, described in B.1, is of limited size (e.g., structure backfill, short length of shoulders, or other areas less than 800 m^2) then a *minimum* of three test sites are required.

C. DETERMINATION OF WET TEST MAXIMUM DENSITY

1. For all treated and untreated soils and aggregates, except Class A Cement Treated Bases, obtain equal representative portions of material from each nuclear test site within the area and thoroughly mix together to form a composite sample. Determine the laboratory wet test maximum density (kg/m^3) on the composite sample in accordance with California Test 216. Record the data on Form TL 2148 in the section identified as "IMPACT TEST DATA" (Figure 1). *The moisture content of the composite sample must be maintained in the same state* as *when the in-place tests were performed.* If the impact test result is to be used in a "common" composite control density, a nuclear moisture, as well as a nuclear density must be taken for each test site in an area and be averaged.

D. CORRECTION FOR OVERSIZE MATERIAL

1. A correction is applied to the composite wet test maximum density in those instances where the composite sample contains more than 10% by weight of aggregate retained on the 19 mm sieve. The data is recorded on Figure 2 in the section titled "SAMPLE FOR ROCK CORRECTION". California Test 216 shows details for handling rock corrections.

E. PERCENT RELATIVE COMPACTION

1. Calculate percent relative compaction as follows:

   Percent relative compaction = [(Average In-Place Wet Density)/(Composite Wet Test Maximum Density)] x 100

2. The calculations for cases where there is 10% or less of +19 mm aggregate is shown on

Figure 1. Note that gage readings for the individual sites are averaged and a mean percent relative compaction calculated for the area.

3. The calculations for cases where there is more than 10% of + 19 mm aggregate is shown in Figure 1.

4. The average relative compaction of the test sites in an area must be at or above the specified minimum compaction density for acceptance of the compaction in the area. The percent relative compaction value is calculated to the nearest 0.1% and then reported as a whole number. For rounding the average percent relative compaction value (Test Result), if the computed value ends in a number with a fractional portion 0.5 or greater, report as the next higher whole number. If the computed value ends in a number with fractional portion less than 0.5, report without changing the whole number.

   Example:

Computed Value	Reporting Value
94.5 to 95.0%	95%
95.0 to 95.4%	

F. WET COMMON-COMPOSITE TEST MAXIMUM VALUE

1. In many cases where the material is the "same", it is permissible to use a *"common"* wet composite test maximum density for use in different areas in lieu of that specified in Section C.1 of this Part II. For a material to be the same, it must comply with the following general criteria:

   a. It must be from the same general source (excavation area, balance point, plant, etc.).

   b. It must generally have the same visual characteristics of color, gradation, and type of soil.

   c. The average in-place moistures must be the "same". Adjustments in moisture are to be made to meet this criteria when *"common"* wet composite test maximum values are used.

2. A *"common"* wet composite test maximum density is initially established by averaging two consecutive wet composite test maximum densities which are within 50 kg/m^3 density and performed within three days. The average moistures between the areas represented by the two consecutive wet composite test maximum values must also be within 50 kg/m^3.

3. Anytime that a wet composite test maximum density is determined for an area, it shall be used to calculate the percent relative compaction for that area.

4. A *"check"* wet composite test maximum must be performed at *least* every 7th calendar day or after the *"common"* wet composite test maximum density has been used for 14 areas, whichever comes first.

   a. If the *"check"* test is within 50 kg/m^3 moisture and density of the *"common"* density, the two values are averaged to establish a new *"common"* density and average moisture. If it is not, wet composite test maximum densities must be performed for each compaction test area until the criteria for F-2 of this PART II are met.

5. If average relative moistures between areas differ and a common composite test maximum is to be established, a correction is applied. The following example illustrates use of a common composite test maximum with moisture corrections. Anytime the engineer judges conditions have changed, a new common composite test maximum should be established. An example where a common composite test maximum is used is shown in Figure 2.

PART III. SAFETY AND HEALTH

Personnel are required to be trained by a qualified instructor approved by the California Department of Health and the Divisions of Industrial Safety.

Caltrans personnel are required to read and be familiar with California Test 121, Administrative Instructions for Use of Nuclear Gages. Caltrans personnel are required to wear a film badge.

This method does not purport to address all the safety problems associated with its use.

REFERENCES:

California Tests 121, 216, 312, and 911

End of Text (14 Pages) on California Test 231

California Test 231
March 2000

Example:	Area I	Area II	Area III	Area IV	Area V	Area VI
Date.....	4-18-96	4-19-96	4-20-96	4-21-96	4-25-96	4-26-96
Average In-Place Wet Density, kg/m^3....	2040	2150	2060	2080	2120	2110
Average In-Place Moisture, kg/m^3.....	90	110	140	80	130	100
Wet Composite Test Maximum Density, kg/m^3.....	2150	2200	-	-	2160	-
Common Composite Wet Test Maximum Density, kg/m^3.....	-	-	2175	2175	-	2168
(Average Moisture, kg/m^3)	-	-	(100)	(100)	-	(115)
Moisture Correction, kg/m^3.....	-	-	-40	+20	-	+15

a. Area I

$$\text{\% Relative Compaction} = \frac{2040}{2150} \times 100 = 95\%$$

b. Area II

$$\text{\% Relative Compaction} = \frac{2150}{2200} \times 100 = 98\%$$

c. Area III

$$\text{Moisture Correction} = \left(\frac{90 + 110}{2}\right) - 140 = -40$$

$$\text{Common Composite Test Max} = \frac{2150 + 2200}{2} = 2175$$

$$\text{\% Relative Compaction} = \frac{2060 - 40}{2175} \times 100 = 93\%$$

See sample forms figures1 and 2.

California Test 231
March 2000

State of California — **Relative Compaction Test-Nuclear** — **Dept of Transportation**

Job Stamp	Contract	Test No.
	Type of Material	
	Material From	
	Impact By	Nuclear By
	Date	Date
Show Test Location and Area Limits	Nonbiased Plan No.	Gage No.

In-Place Test by Nuclear

	Site	Den. Ct.___mm	Std. Ct. Density
A	1		
	2		
	3		Σ
	4		F $\bar{X}$
	5		Moist Count 1
	6		2
	7		3
	8		4
			5
			6
			7
			8
B	Σ		Σ
C	$\bar{X}$		G $\bar{X}$

CR(C/F) CR(G/I

D $\bar{X}$ Den. g/ml H $\bar{X}$ H2O g/ml Σ

E $\bar{X}$ Den. Corr. For Moist.**± I $\bar{X}$

**E = D ± Diff. Bet. $\bar{X}$ Moist.Fr. Common TM & H

Percent Relative Compaction		Spec.	Individual	
			Moving Ave.	

*E/K for10% ≤ + 19mm E/W for > 10% + 19mm

If Common Test Maximum is used ($\bar{X}$) K or W = $\bar{X}$ H2O=

From Tests: Dated:

Remarks:

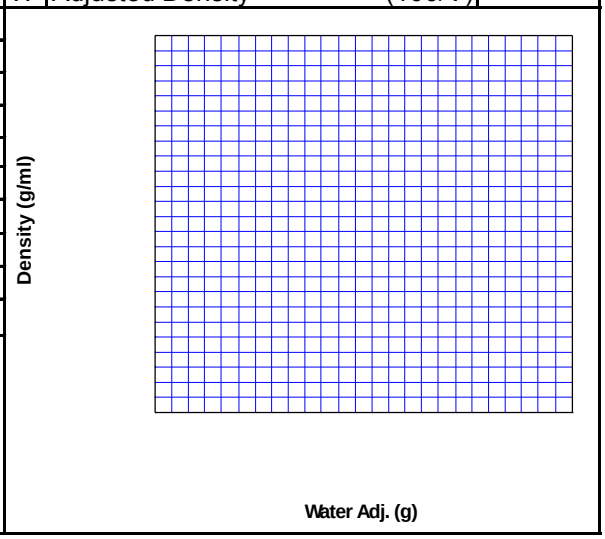
Impact Test Data

J	Initial Wet Weight of Test Specimen (g)				
	Specimen	1	2	3	4
	Water Adjustment				
	Tamper Reading				
K	Wet Density				
	K From Table 1Test Method 216. Highest Density is Test Max.				
L	(+) 19mm Agg. Adj.				

% + 19mm (Q) Adj.
20 or less_ 1.00
21-25_____0.99
26-30_____0.98
31-35_____0.97
36-40_____0.96
41-45_____0.95
46-50_____0.94
Std. Count Moist

Sample for Rock Correction

M	Total Sample Wt.	(g)	
N	+ 19mm Wt.in Air	(g)	
O	+ 19mm Wt. In Water	(g)	
P	+ 19mm Vol	(N-O)	
Q	% + 19mm	100(N/M)	
R	% - 19mm	(100-Q)	
S	Density of + 19mm	(N/P)	
T	% + 19mm /Den. Of + 19mm	(Q/SL)	
U	% -19mm /Den. Of - 19mr	(R/K)	
V	Sum of T and U	(T+U)	
W	Adjusted Density	(100/V)	



TL 2148 (Rev 03/00) Figure 1

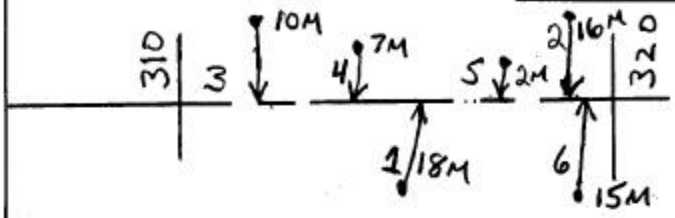
California Test 231
March 2000

State of California — **Relative Compaction Test-Nuclear** — **Dept of Transportation**

Job Stamp

Contract | Test No. 25
Type of Material EMB
Material From
Impact By FC | Nuclear By BL
Date 03/30/00 | Date 03/30/00
Nonbiased Plan No. 8 | Gage No. NE 59

Show Test Location and Area Limits



EXAMPLE ONLY

In-Place Test by Nuclear

	Site	Den. Ct. 200mm	Std. Ct. Density	
A	1	466558	515477	
			515222	
	2	445988	519047	
			512677	K
	3	49747		
			Σ 2062400	L
	4	464533	F x̄ 515600	
			Moist Count	
	5	47741	1	
			2	
	6	46380	3	
			4	
	7		5	
			6	
	8		7	
			8	
B	Σ	2815777	Σ	
C	x̄	469300	G x̄	
CR(C/F)		.910	CR(G/I	
D	x̄ Den. g/ml	2.23	H x̄ H2O g/ml	
E	x̄ Den. Corr. For Moist.** ±		I x̄	

**E = D ± Diff. Bet. x̄ Moist.Fr. Common TM & H

Percent Relative Compaction	89	Spec.	Individual	90
			Moving Ave.	

*E/K for 10% ≤ + 19mm E/W for > 10% + 19mm

If Common Test Maximum is used (x̄) K or W = | x̄ H2O=

From Tests: Dated:

Remarks:

Impact Test Data

J	Initial Wet Weight of Test Specimen (g)				2700
	Specimen	1	2	3	4
	Water Adjustment	0	+50	+100	
	Tamper Reading	10.5	10.3	10.4	
K	Wet Density	2.44	2.48	2.46	

K From Table 1Test Method 216. Highest Density is Test Max.

L (+) 19mm Agg. Adj.

% + 19mm (Q) Adj.
20 or less 1.00
21-25 0.99
26-30 0.98
31-35 0.97
36-40 0.96
41-45 0.95
46-50 0.94

Std. Count Moist

Sample for Rock Correction

M	Total Sample Wt. (g)		14000
N	+ 19mm Wt.in Air (g)		2380
O	+ 19mm Wt. In Water (g)		1465
P	+ 19mm Vol	(N-O)	915
Q	% + 19mm	100(N/M)	17.0
R	% - 19mm	(100-Q)	83.0
S	Density of + 19mm	(N/P)	2.60
T	% + 19mm /Den. Of + 19mm	(Q/SL)	6.5
U	% -19mm /Den. Of - 19mm	(R/K)	33.5
V	Sum of T and U	(T+U)	40.0
W	Adjusted Density	(100/V)	2.50

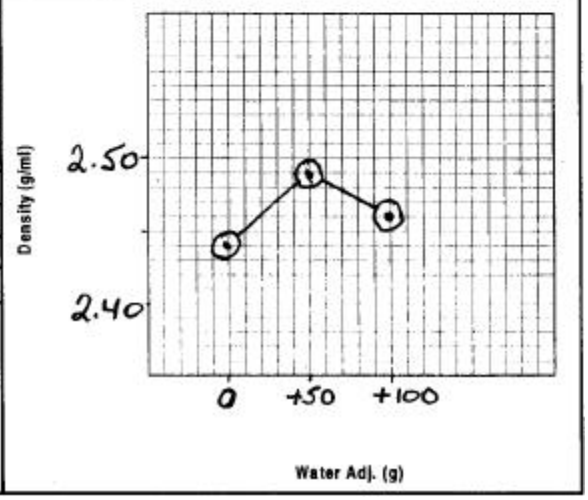


Figure 2

NONBIASED SAMPLE PLANS

Once an area is selected on the basis of uniformity of factors, nonbiased location of measurement sites is required for applying statistical control procedures. The nonbiased sample location plans will randomly locate the approximate measurement sites.

NOTE: The number of measurement sites must be determined after the area has been determined and *before* any tests performed.

PROCEDURE FOR USE OF NONBIASED SAMPLE PLANS

1 a. Use the last digit from the first reading taken for the daily standard count to select the plan for the first area. For subsequent areas, use the last digit from the second, third, and fourth readings. If five through nine areas are tested, use the second to the last digit from the first through the fourth readings taken for the daily standard count.

b. For nuclear gages that electronically average the standard counts — Take a $^{1}/_{4}$ minute count in the safe position at any convenient location, i.e., ground, truck bed, carry case, etc., prior to selecting the plan for an area. Use the last digit of the density reading for selecting the plan. A new count should be taken for each area.

2. Visualize the plan as a map of the area to be sampled.

3. Each dot represents a measurement site. There are ten dots numbered from one (1) through ten (10). If you are to take a five- (5) site test, then use the dots numbered from one (1) through five (5). If a three-site test is going to be used, then use the locations of the first three dots. This procedure will be used for all tests, with Number 1 dot the first site, Number 2 dot the second site and so on until the desired number of sites have been used.

4. Test at the approximate locations on the grade represented by the dots on the plan. Some adjustments are necessary for irregular areas. (See Figure 3)

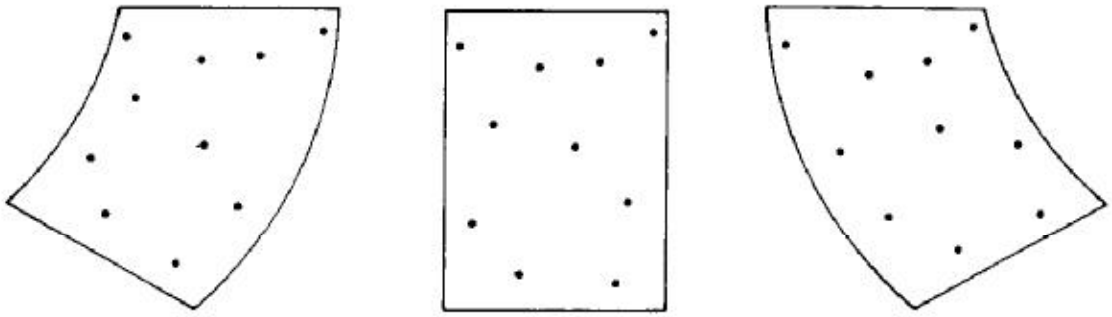
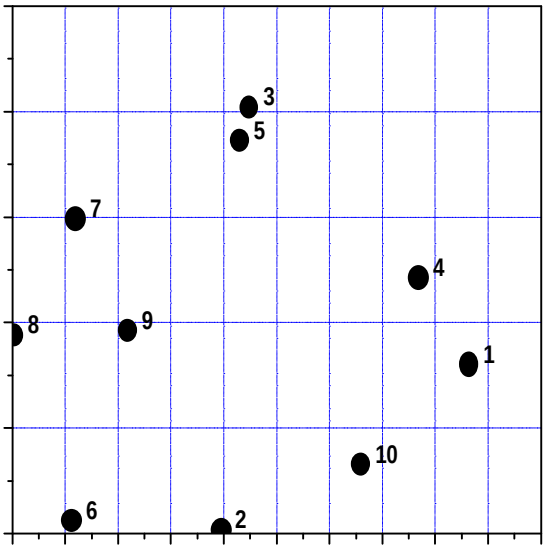


Figure 3

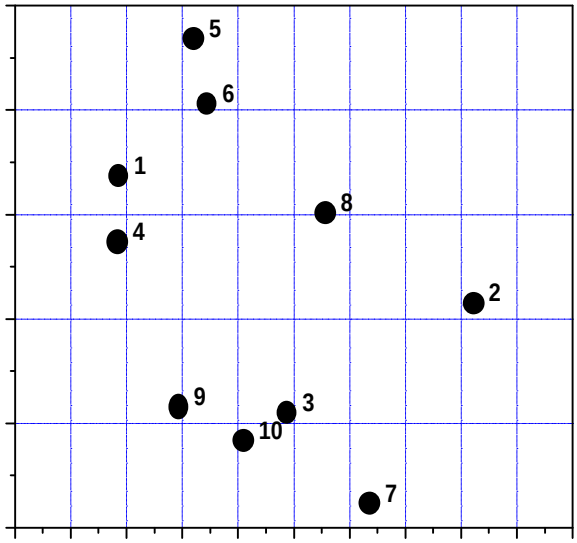
California Test 231
March 2000

Figure 3 Cont.

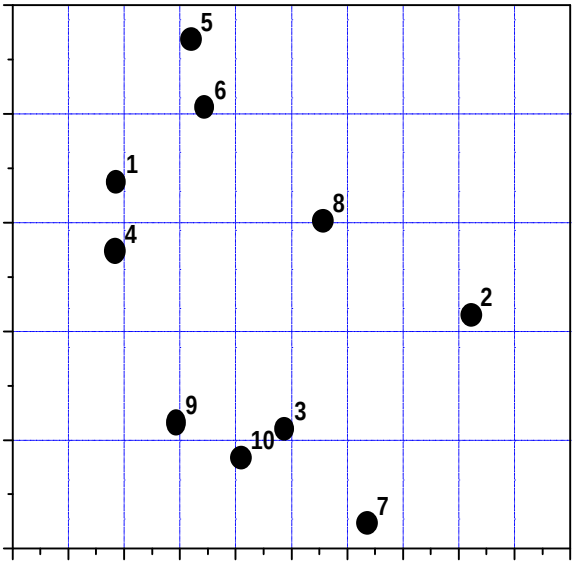
NONBIASED PLAN 1



NONBIASED PLAN 2



NONBIASED PLAN #3



NONBIASED PLAN #4

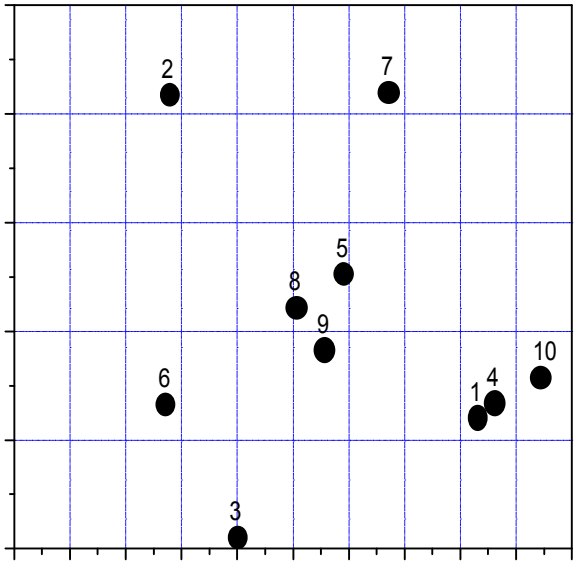
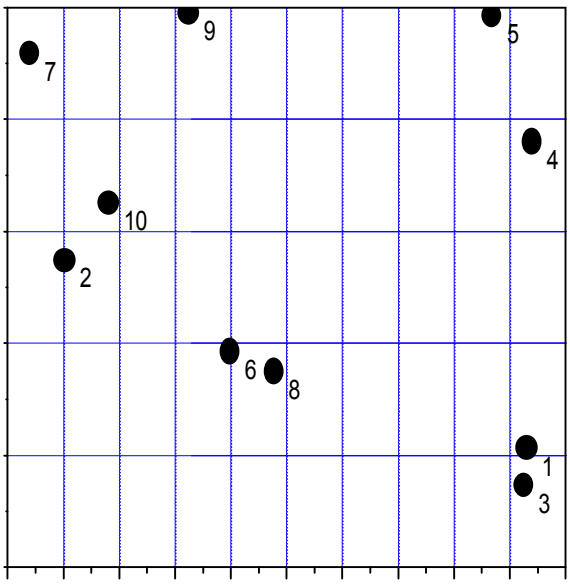
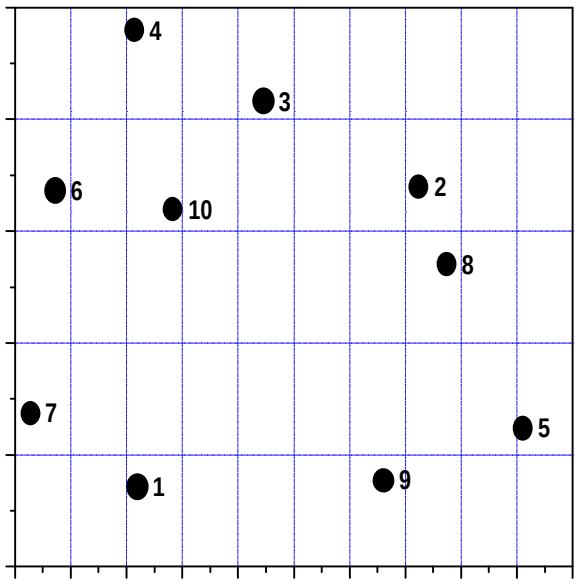


Figure 3 Cont.

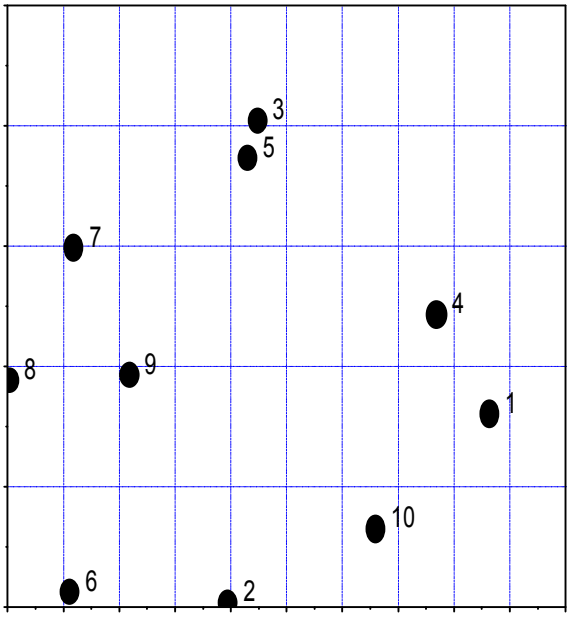
NONBIASED PLAN 5



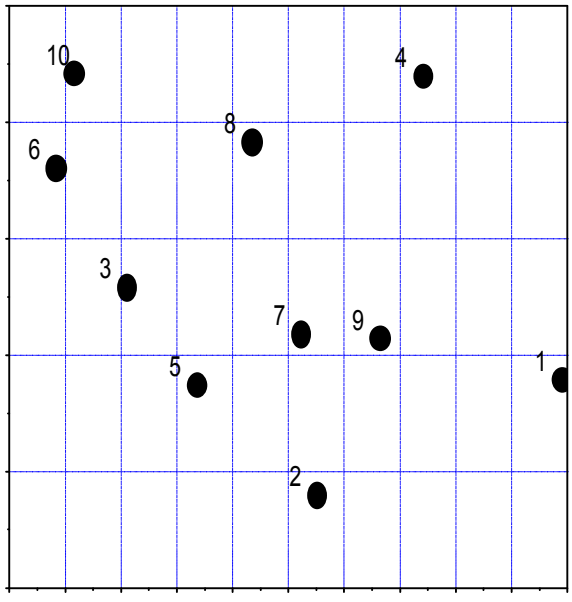
NONBIASED PLAN 6



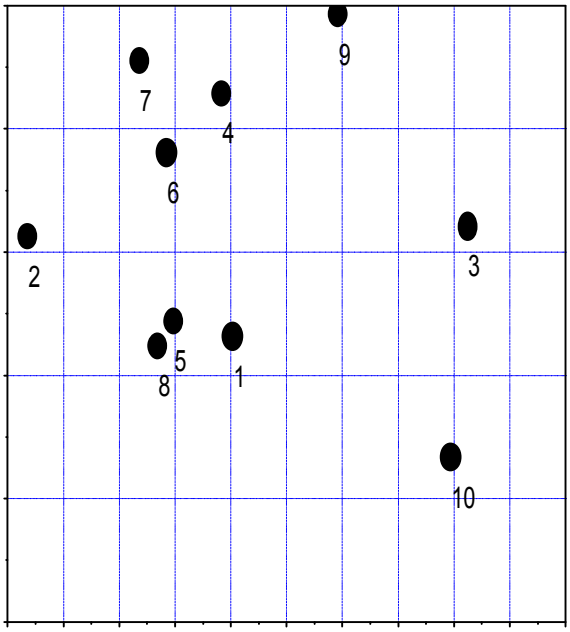
NONBIASED PLAN #7



NONBIASED PLAN #8



NONBIASED PLAN 9



NONBIASED PLAN 10

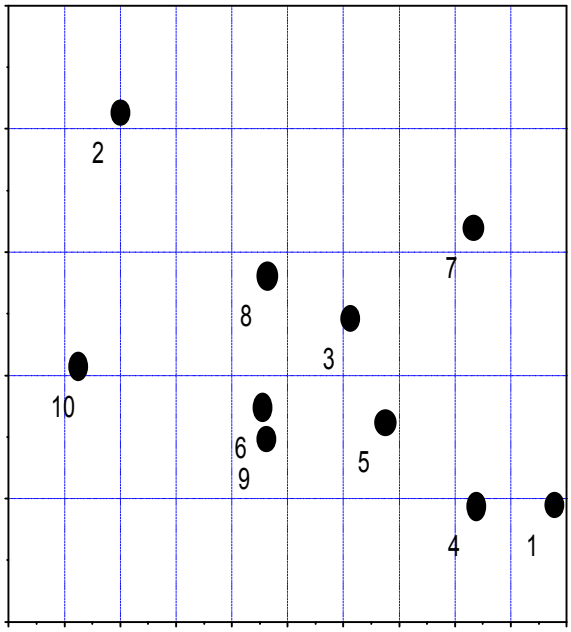


Figure 3 Cont.

TABLE 2
COUNT RATIO VS. DENSITY FOR NUCLEAR GAGE NO. NE 59

District 19 January 3, 1978 Std. Ct 51500 200 mm D/T By B. Lister

BASED ON: DENSITY (kg/m3) 1532 1636 2018 2153 2680 2771

COUNT RATIO 1.791 1.553 1.192 .933 .597 .542

CR TO CR	kg/m3	CR TO CR	kg/m3	CR TO CR	kg/m3
2.000-2.018	1400	1.364-1.376	1800	.931- .939	2200
1.981-1.999	1410	1.351-1.363	1810	.922- .930	2210
1.962-1.980	1420	1.338-1.350	1820	.913- .921	2220
1.943-1.961	1430	1.326-1.337	1830	.905- .912	2230
1.925-1.942	1440	1.313-1.325	1840	.896- .904	2240
1.907-1.924	1450	1.300-1.312	1850	.887- .895	2250
1.888-1.906	1460	1.288-1.299	1860	.879- .886	2260
1.870-1.887	1470	1.276-1.287	1870	.874- .878	2270
1.853-1.869	1480	1.264-1.275	1880	.862- .870	2280
1.835-1.852	1490	1.252-1.263	1890	.854- .861	2290
1.817-1.834	1500	1.240-1.251	1900	.846- .853	2300
1.800-1.816	1510	1.228-1.239	1910	.838- .845	2310
1.783-1.799	1520	1.216-1.227	1920	.830- .837	2320
1.766-1.782	1530	1.205-1.215	1930	.822- .829	2330
1.749-1.765	1540	1.193-1.204	1940	.814- .821	2340
1.733-1.748	1550	1.182-1.192	1950	.807- .813	2350
1.716-1.732	1560	1.171-1.181	1960	.799- .806	2360
1.700-1.715	1570	1.160-1.170	1970	.791- .798	2370
1.684-1.699	1580	1.148-1.159	1980	.784- .790	2380
1.667-1.683	1590	1.138-1.147	1990	.776- .783	2390
1.652-1.666	1600	1.127-1.137	2000	.769- .775	2400
1.636-1.651	1610	1.116-1.126	2010	.762- .768	2410
1.620-1.635	1620	1.105-1.115	2020	.755- .761	2420
1.605-1.619	1630	1.095-1.104	2030	.747- .754	2430
1.590-1.604	1640	1.085-1.094	2040	.740- .746	2440
1.574-1.589	1650	1.074-1.084	2050	.733- .739	2450
1.560-1.573	1660	1.064-1.073	2060	.726- .732	2460
1.545-1.559	1670	1.054-1.063	2070	.719- .725	2470
1.530-1.544	1680	1.044-1.053	2080	.713- .718	2480
1.515-1.529	1690	1.034-1.043	2090	.706- .712	2490
1.501-1.514	1700	1.024-1.033	2100	.699- .705	2500
1.487-1.500	1710	1.014-1.023	2110	.692- .698	2510
1.473-1.486	1720	1.005-1.013	2120	.686- .691	2520
1.458-1.472	1730	.995-1.004	2130	.679- .685	2530
1.445-1.457	1740	.986- .994	2140	.673- .678	2540
1.431-1.444	1750	.976- .985	2150	.667- .672	2550
1.417-1.430	1760	.967- .975	2160	.660- .666	2560
1.404-1.416	1770	.958- .966	2170	.654- .659	2570
1.390-1.403	1780	.949- .957	2180	.648- .653	2580
1.377-1.389	1790	.940- .948	2190	.642- .647	2590

California Test 231
March 2000

TABLE 3

COUNT RATIO VS DENSITY FOR NUCLEAR GAUGE NO. NE 59

District 19, January 3, 1978, Std. Ct 11400 By B. Lister

BASED ON kg/m3	0	303
COUNT RATIO	.168	.686

CR TO CR	kg/m3	CR TO CR	kg/m3	CR TO CR	kg/m3
.155- . 171	00	.501- . 517	200	.847- .863	400
.172- . 188	10	.518- . 534	210	.864- .880	410
.189- .206	20	.535- . 552	220	.881- .897	420
.207- .223	30	.553- .569	230	.898- . 915	430
.224- . 240	40	.570- .586	240	.916- .932	440
.241- .258	50	.587- . 603	250	.933- . 949	450
.259- . 275	60	.604- .621	260	.950- .967	460
.276- .292	70	.622- . 638	270	.968- .984	470
.293- . 309	80	.639- .655	280	.985-1.001	480
.310- .327	90	.656- .673	290	1.002-1.018	490
.328- .344	100	.674- .690	300	1.019-1.036	500
.345- .361	110	.691- .707	310	1.037-1.053	510
.362- . 379	120	.708- .724	320	1.054-1.070	520
.380- .396	130	.725- . 742	330	1.071-1.088	530
.397- .413	140	.743- .759	340	1.089-1.105	540
.414- . 431	150	.760- .776	350	1.106-1.122	550
.432- .448	160	.777- .794	360	1.123-1.140	560
.449- .465	170	.795- . 811	370	1.141-1.157	570
.466- .482	180	.812- . 828	380	1.158-1.174	580
.483- . 500	190	.829- .846	390	1.175-1.191	590

INDEX OF PLANS

SHEET No.	DESCRIPTION
1	TITLE

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO BIDDERS AND SPECIAL PROVISIONS BOOK.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

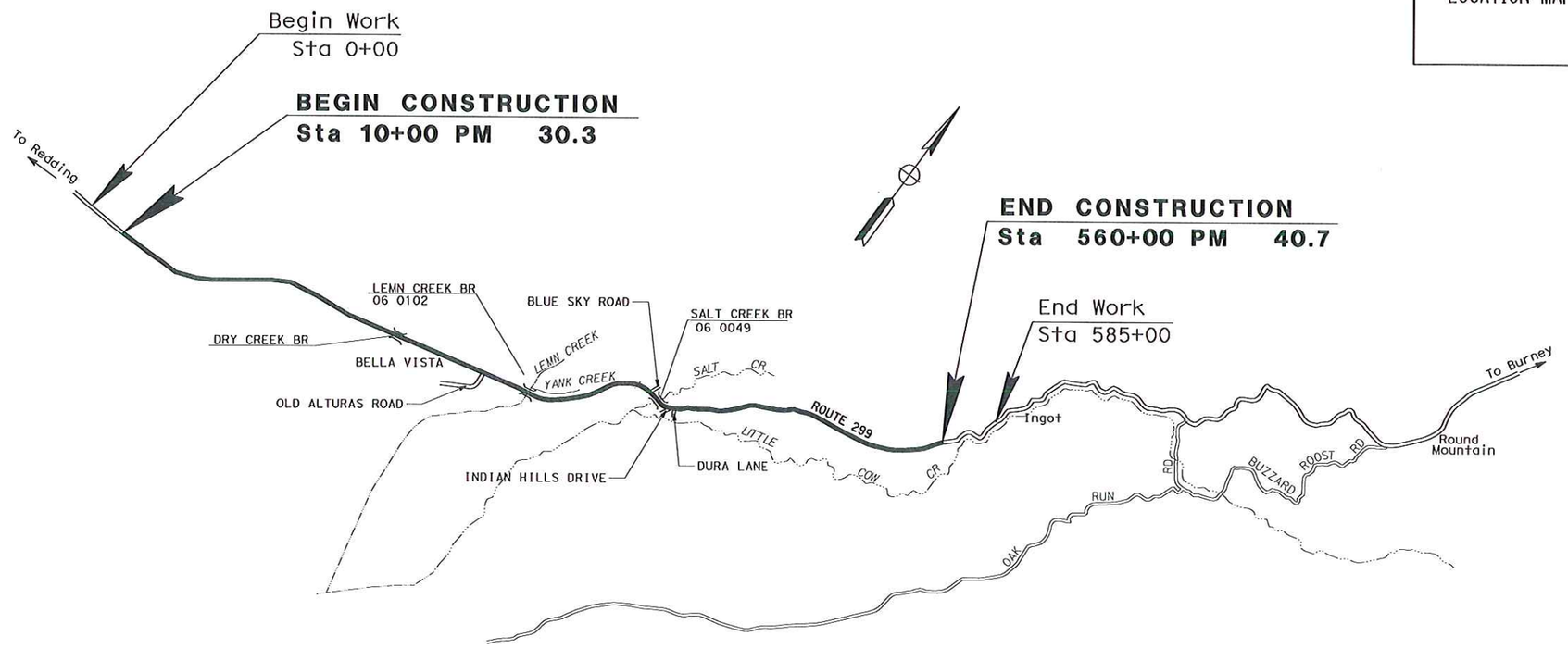
STATE HIGHWAY

IN SHASTA COUNTY AT AND NEAR BELLA VISTA FROM 0.3 MILE EAST OF INTERMOUNTAIN DRIVE TO 0.3 MILE WEST OF BACKBONE RIDGE ROAD

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Sha	299	30.3/40.7	1	##

LOCATION MAP



PRELIMINARY

PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

DESIGN ENGINEER: JULIE CASEY
PROJECT MANAGER: PHIL BAKER

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO CONTRACTORS."

Exhibit A-3

CONTRACT No.	02-360704
PROJECT ID	0200000317

DATE PLOTTED => 12-SEP-2012
TIME PLOTTED => 11:14
LAST REVISION 7-22-11

P:\proj\02\360704\design\Plan Sheets\236070_ab001.dgn

BORDER LAST REVISED 3/1/2007 | CALTRANS WEB SITE IS: HTTP//WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => s131271 DGN FILE => 236070_ab001.dgn | UNIT 0318 | PROJECT NUMBER & PHASE 02000003171

Attachment C - Project Design Plans

P & Q

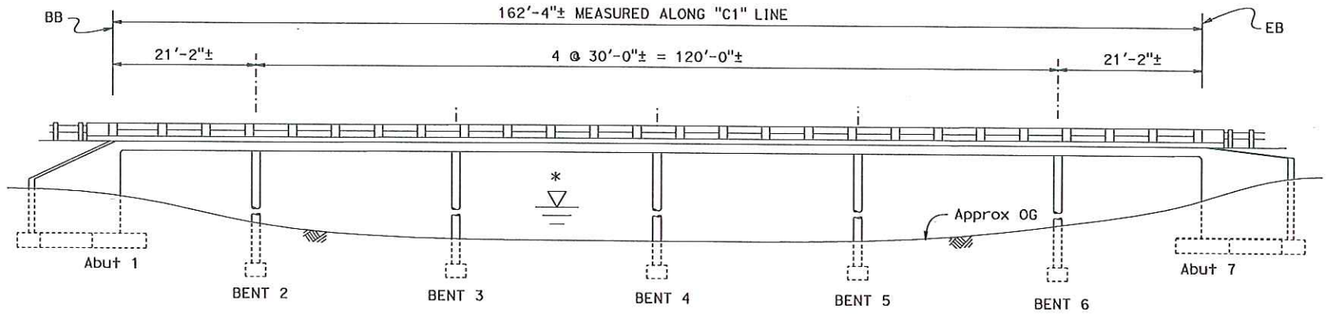
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
02	Sha	299			

REGISTERED CIVIL ENGINEER — X — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — LEWIS L SHEN — No. 56921 — Exp. 6-30-13 — CIVIL — STATE OF CALIFORNIA

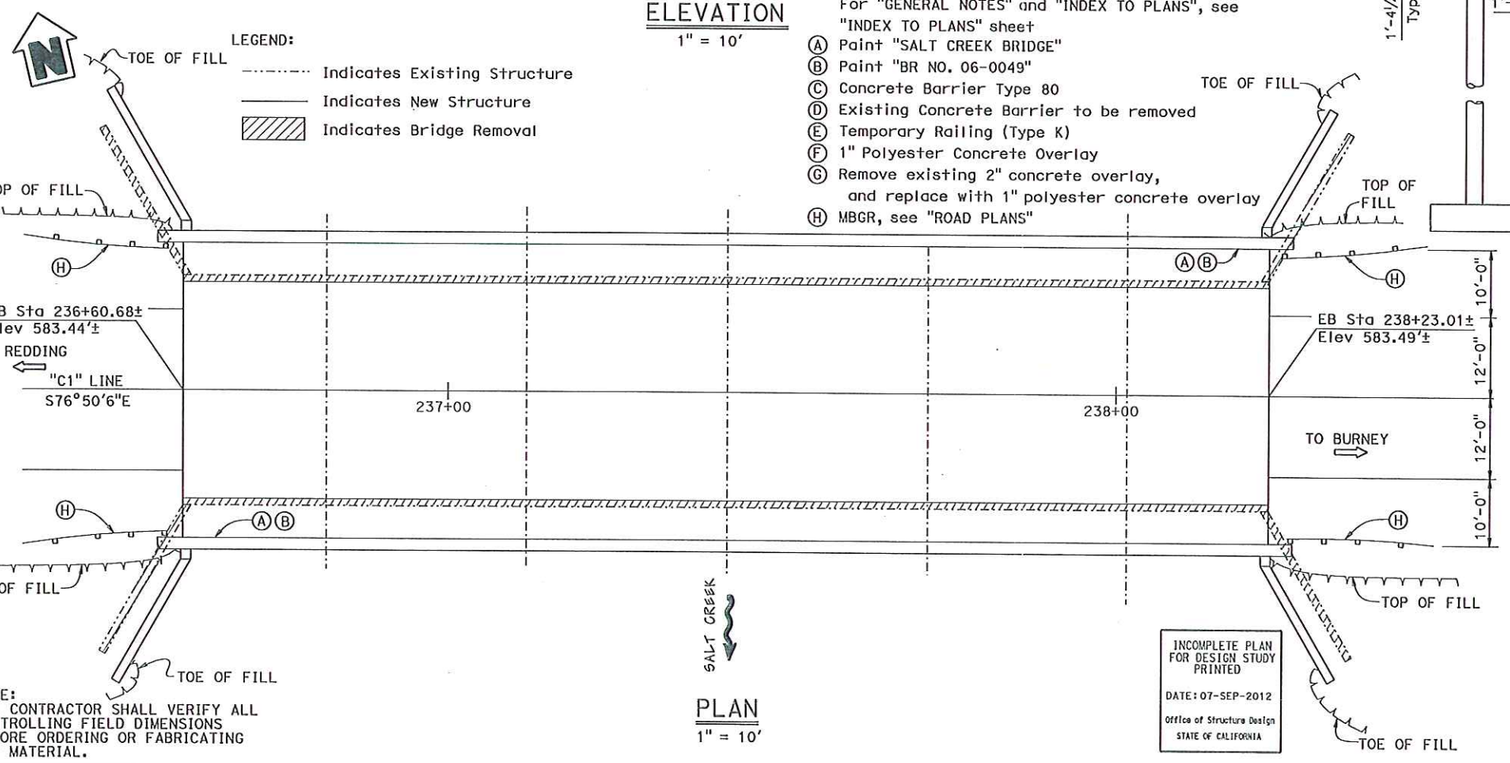
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



* For "HYDROLOGIC SUMMARY", see "FOUNDATION PLAN" sheet

ELEVATION

1" = 10'



NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

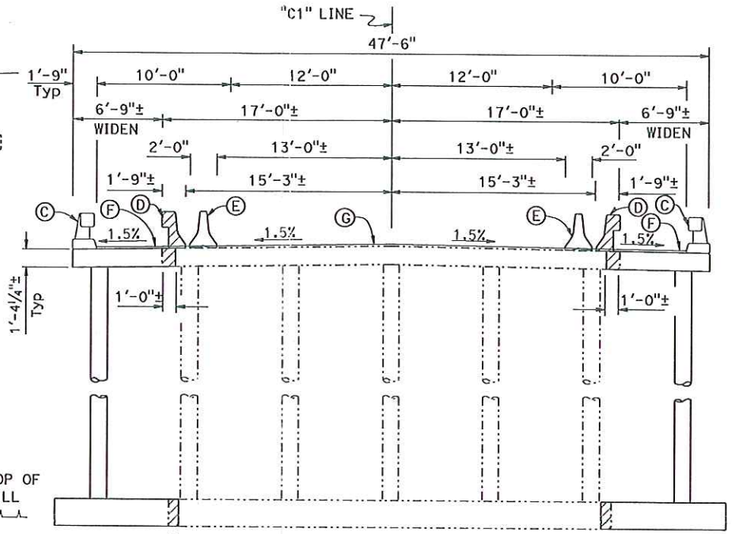
PLAN

1" = 10'

NOTES:

For "GENERAL NOTES" and "INDEX TO PLANS", see "INDEX TO PLANS" sheet

- (A) Paint "SALT CREEK BRIDGE"
- (B) Paint "BR NO. 06-0049"
- (C) Concrete Barrier Type 80
- (D) Existing Concrete Barrier to be removed
- (E) Temporary Railing (Type K)
- (F) 1" Polyester Concrete Overlay
- (G) Remove existing 2" concrete overlay, and replace with 1" polyester concrete overlay
- (H) MBGR, see "ROAD PLANS"



TYPICAL SECTION

1" = 5'

Vehicular Traffic

1. ___ New alignment. No traffic at the site.
2. ___ Traffic will be detoured away from the site.
3. X Traffic will be carried on the structure.
   Stage construction ~~will~~/will not be required.
4. ___ Traffic will pass under the structure on _____ (Name of St. or Hwy.)
   - A. ___ No falsework allowed over traffic.
   - B. ___ Falsework opening(s) required:

	Temporary Vertical Clearance	Width of Traffic Opening
_____ Bnd	_____	_____
_____ Bnd	_____	_____
_____ Two-way	_____	_____

   - C. ___ Temporary traffic lane reduction needed for footing excavation.

Pedestrian Traffic

Falsework opening required on _____ (Name of St.)

Location	Height	Width
_____	_____	_____

Joseph E Downing DESIGN ENGINEER	DESIGN	BY Quangh H Nguyen	CHECKED Art Herrera	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE; VEHICLE		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH 3	BRIDGE NO. 06-0049 POST MILE 34.56	SALT CREEK BRIDGE (WIDEN) GENERAL PLAN
	DETAILS	BY Janie Chiubna	CHECKED Art Herrera	LAYOUT	BY Quang H Nguyen	CHECKED Art Herrera				
	QUANTITIES	BY Sharon Yen	CHECKED Lewis Shen	SPECIFICATIONS	BY X	PLANS AND SPECS COMPARED X				

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3578 PROJECT NUMBER & PHASE: 02000002621 CONTRACT NO.: 02-360701

FILE => 06-0049-a-gp.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES			SHEET	OF
7-19-11		9-7-12	1	X

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

USERNAME => s1172963 DATE PLOTTED => 07-SEP-2012 TIME PLOTTED => 11:07

Exhibit B-1

Attachment C - Project Design Plans

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Sha	299			

REGISTERED CIVIL ENGINEER X DATE

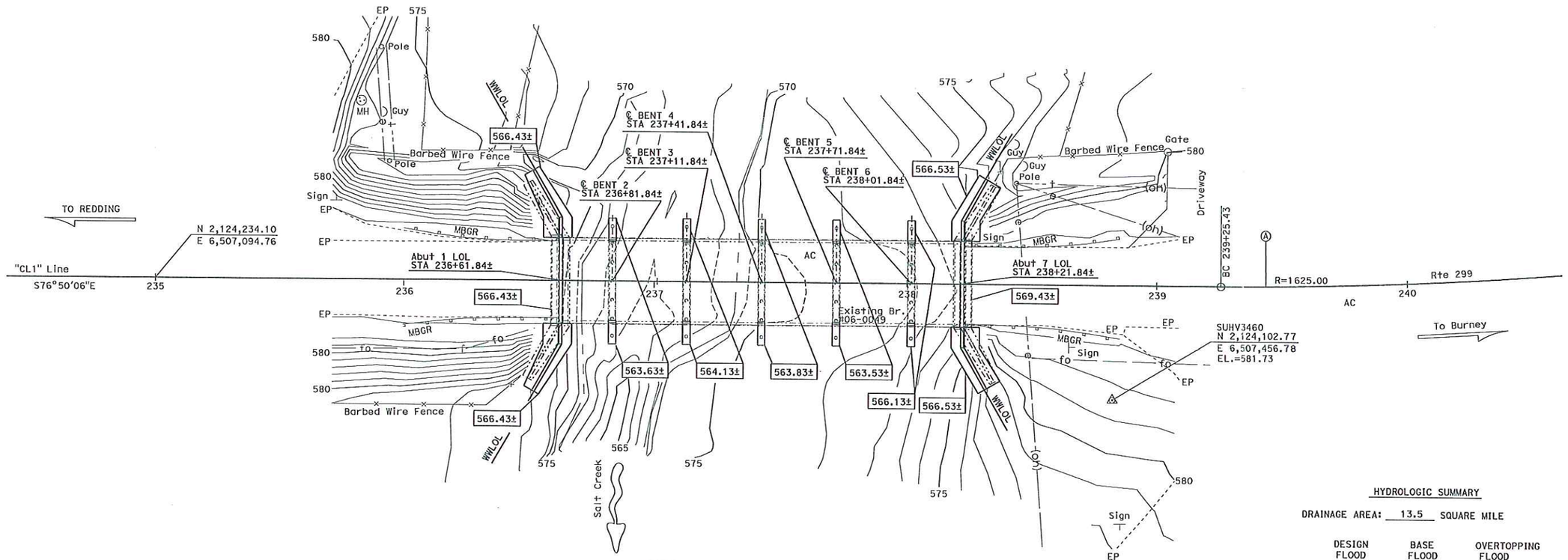
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — LEWIS L SHEN — No. 56921 — Exp. 6-30-13 — CIVIL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

CURVE DATA

No.	R	Δ	T	L
Ⓐ	1625.00	46°11'33"	693.00	1310.09



SURVEY CONTROL

SUHV3434 (Not Shown)

Fnd Rebar/Cap
43.93' Lt. "CL1" Line, Rte 299
Sta. 224+80.08
N 2,124,480.81
E 6,506,100.77
EL.=597.36

SUHV3460

Fnd 3" Brass Disc in Concrete
45.42' Rt. "CL1" Line, Rte 299
Sta. 238+82.42
N 2,124,102.77
E 6,507,456.78
EL.=581.73

LEGEND:

Indicates Bottom of Footing Elevation

HYDROLOGIC SUMMARY

DRAINAGE AREA: 13.5 SQUARE MILE

	DESIGN FLOOD	BASE FLOOD	OVERTOPPING FLOOD
FREQUENCY (YEARS)	50	100	N/A
DISCHARGE (CUBIC FEET PER SECOND)	4650	5800	N/A
WATER SURFACE ELEV. AT BRIDGE (FEET)	574.7	575.7	N/A

THE FLOOD PLAIN DATA ARE BASED UPON INFORMATION AVAILABLE WHEN THE PLANS WERE PREPARED AND ARE SHOWN TO MEET FEDERAL REQUIREMENTS. THE ACCURACY OF SAID INFORMATION IS NOT WARRANTED BY THE STATE AND INTERESTED OR AFFECTED PARTIES SHOULD MAKE THEIR OWN INVESTIGATIONS.

NOTES:

1. Approximate Dimensions of Abut. Footing are calculated from As-Built sheet 3 of 9 dated on 2/13/1969.
2. Elec. Line, Fiber Optic Line, and Tele. Line Per Dist. Utility Map.

PRELIMINARY INVESTIGATION SECTION

SCALE 1"=20'	VERT.DATUM NAVD 88	PHOTOGRAMMETRY AS OF: X					
	HORZ.DATUM NAD83 (92)	SURVEYED	BY District	CHECKED	BY Don Ivy 11/2011		
ALIGNMENT TIES Dist. Traverse Sheet		DRAFTED	BY Sharon Zheng 11/2011	CHECKED	BY Lawrence Lew 11/2011		

STRUCTURES FOUNDATION PLAN SHEET (ENGLISH) (REV. 09-01-10)

DESIGN	BY Quang H Nguyen	CHECKED Art Herrera
DETAILS	BY Janie Chlubna	CHECKED Art Herrera
QUANTITIES	BY Sharon Yen	CHECKED Lewis Shen

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 3

UNIT: 3646
PROJECT NUMBER & PHASE: 02000002621 CONTRACT NO.: 02-360701

FILE => 06-0049-d-fp.dgn

BRIDGE NO.	POST MILE
06-0049	34.56

SALT CREEK BRIDGE (WIDENING)
FOUNDATION PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES			SHEET	OF
11-29-11	9-1-12	7-25-12	3	X

B-3

Attachment C - Project Design Plans

Bella Diddy Rehabilitation Project
Revegetation and Monitoring Plan for Salt Creek Bridge
State Route 299 (Post Miles 30.3/40.7), Shasta County
Township 32N, Range 4 W, Section 13
& Township 33 N, Range 2 W, Sections 21
EA 02-36070

March 2013

Contact: Patrick Sullivan Project Landscape Architect
Phone Number (530) 225-3413

Project Description

The California Department of Transportation (Caltrans) proposes a safety project in Shasta County, along State Route (SR) 299 between post miles 30.3/40.7 and 4.3. The project is called "Bella Diddy" due to its location near Bella Vista and Diddy Wells Fire Station. As part of the roadway project, the existing Salt Creek Bridge will be widened to accommodate 10-foot shoulders on the bridge.

The project is designed to improve roadway safety and increase sight distance, in the vicinity of the bridge and existing Indian Oaks Drive, Blue Sky Drive, and Dura Lane.

The roadway will provide 12 ft lanes and 8 ft paved shoulders. The paved shoulders will taper out to 10 feet to match the widening on the bridge.

Existing Vegetation

The project area contains a mixture of vegetation types, determined primarily by slope, and proximity to creek side water. Dominant vegetation types include blue oak-savanna and yellow willow-Oregon ash riparian.

Under-story vegetation includes riparian and upland varieties, Himalayan blackberry, yellow willow, poison oak, and a variable grass and forb layer.

The riparian type within the project area consists mostly of upland and creek side plants. Predominant riparian vegetation includes Oregon ash, yellow willow, blackberry and wild grape.

Proposed Revegetation Plan

The revegetation plan consists of two components. The first part is called the **Hydroseeding** (EC) and the second part is called the **Reveg Plan**. These two elements will work together to revegetate as much of the disturbed areas around the bridge as

EXHIBIT B-4

described below. The EC will cover approximately **0.6** acres and the Reveg Plan will cover **0.5** acres. Total revegetation is **0.65**acres.

Erosion Control Plans

The EC is designed to quickly establish vegetative cover. Most of the area covered by the EC consists roadside and bridge slopes. These slopes are generally moderate in steepness and also have soil properties that will support regular plant establishment. Thus the EC will consist of a hydro-seeding application that includes fiber-straw, slow release fertilizer, and soil tackifier. The hydro seeding is applied both to the new bridge and creek side slopes.

The hydro-seed mix consists of the following seeds:

Scientific Name	**Common Name**
Eschscholzia californica	California poppy
Festuca idahoensis	Western fescue
Lasthenia galbrata	Goldfields
Layia platyglossa	Tidy Tips
Lotus purshianus	Spanish clover
Lupinus bicolor	Sky lupine
Lupinus nanus	Dwarf lupine
Lupinus succulentus	Arroyo lupines
Trifolium hirtum	Rose clover
Vulpia microstachys	Three weeks fescue

All plants that are considered native to California per the Jepson Manual are shown in bold-face font (scientific name). Plan sheets for the EC & Reveg are shown in **Attachment A**. The sheet is labeled RV-2.

Reveg Plan

On areas where shown on the plans, and in appropriate soil locations; native plant establishment will be implemented.

Seedling liners purchased from a local nursery will be installed in the fall, after the construction contract work is completed and winter rains have started. Individual planting holes will excavated (usually by hand), backfilled and complimented with DriWater (or equivalent). The watering assistive devices (DriWater or equivalent) will be installed adjacent to the plants. The watering assistive devices will be maintained as necessary for two summers following installation.

The following upland species will be planted in the Reveg areas as shown on the plans:

Trees – Oregon Ash & Valley Oaks
Shrubs – California rose.

These species are native to the project area and are relatively hardy and heat resistant.

In addition to the existing willows, yellow willow stakes will be placed along the rock slope protection besides the new bridge.

Monitoring

Survival of the planted vegetation (Reveg plan) will be maintained for a 3-year period. Maintenance will begin the season immediately following planting. Maintenance will record survival rates, water availability, erosion problems, human and wildlife disturbance, and overall health of the plantings. Maintenance will take into account variable precipitation and weather conditions and their effects on vegetation establishment and growth. The Caltrans landscape department in coordination with Caltrans revegetation specialists and the California conservation corps will monitor plant watering needs, in order to implement supplemental watering when needed.

Success criteria will be based on survival rates of first and second year plantings. If additional planting is required, a third year of planting will be implemented. Maintenance will be analyzed each year to improve the overall planting success. Reveg plan sheets are shown in **Appendix A**. The Reveg plan sheet is labeled RV-2.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
02	Sha	299	30.3/40.7		-

PRELIMINARY

LICENSED LANDSCAPE ARCHITECT

-

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

LICENSED LANDSCAPE ARCHITECT J. PATRICK SULLIVAN #3125 Signature 07-28-14 Renewal Date 02-01-13 Date STATE OF CALIFORNIA

To get to the Caltrans web site, go to: http://www.dot.ca.gov

LEGEND

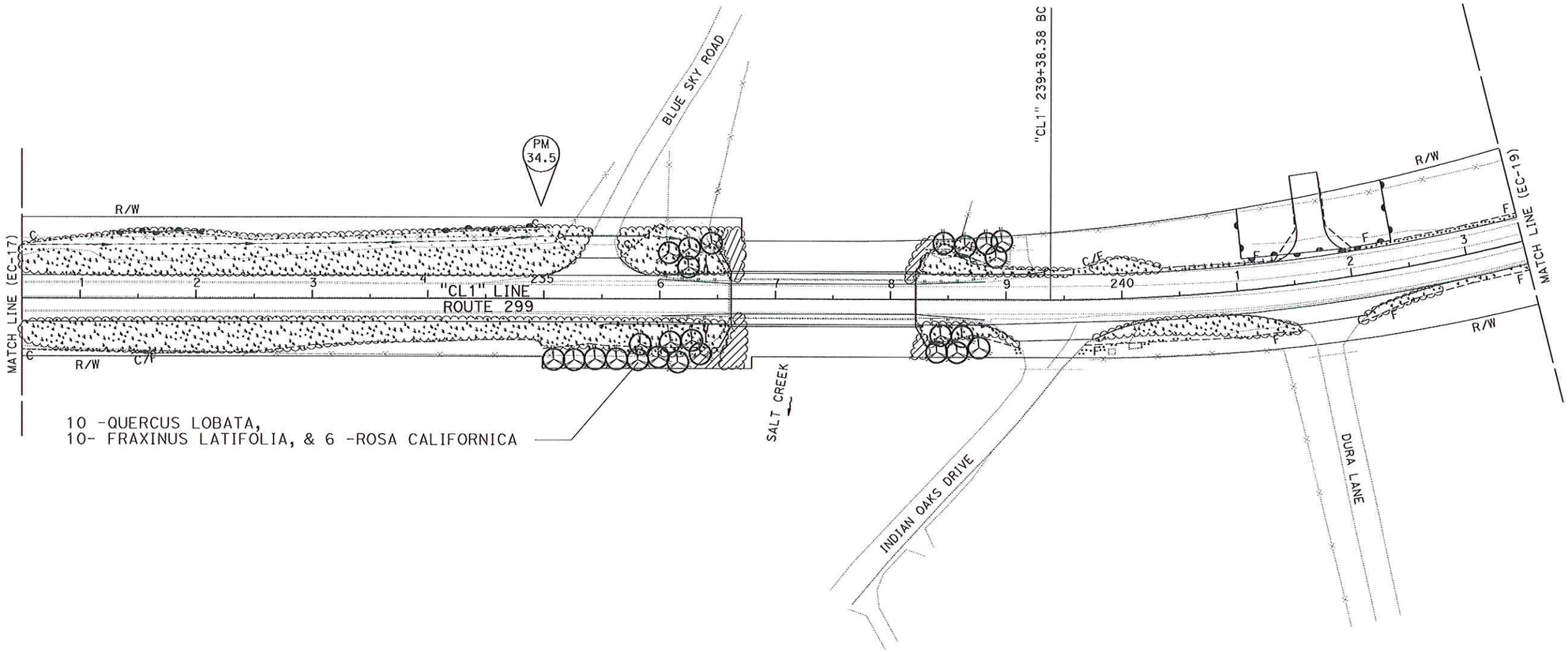
- REVEGETATION TREE/LARGE SHRUB LOCATIONS, (FROM LINERS -OREGON ASH, VALLEY OAKS & CALIFORNIA ROSES) 15' ON CENTER
- EXISTING WILLOW LOCATIONS, (CUT BACK TO GRADE TO INCOURAGE ROOT SPROUTING)
- -HYDROSEED

QUANTITIES

15 TOTAL

2600 sq ft

12,500 sq ft



SALT CREEK REVEGETATION PLAN

SCALE: 1" = 50'

RV-2

APPROVED FOR LANDSCAPE WORK ONLY

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
LANDSCAPE ARCHITECTURE

PROJECT LANDSCAPE ARCHITECT: RON FLORY
CALCULATED/DESIGNED BY: J. PATRICK SULLIVAN
CHECKED BY: RON FLORY
DATE REVISED: -
REVISED BY: -
DATE: -

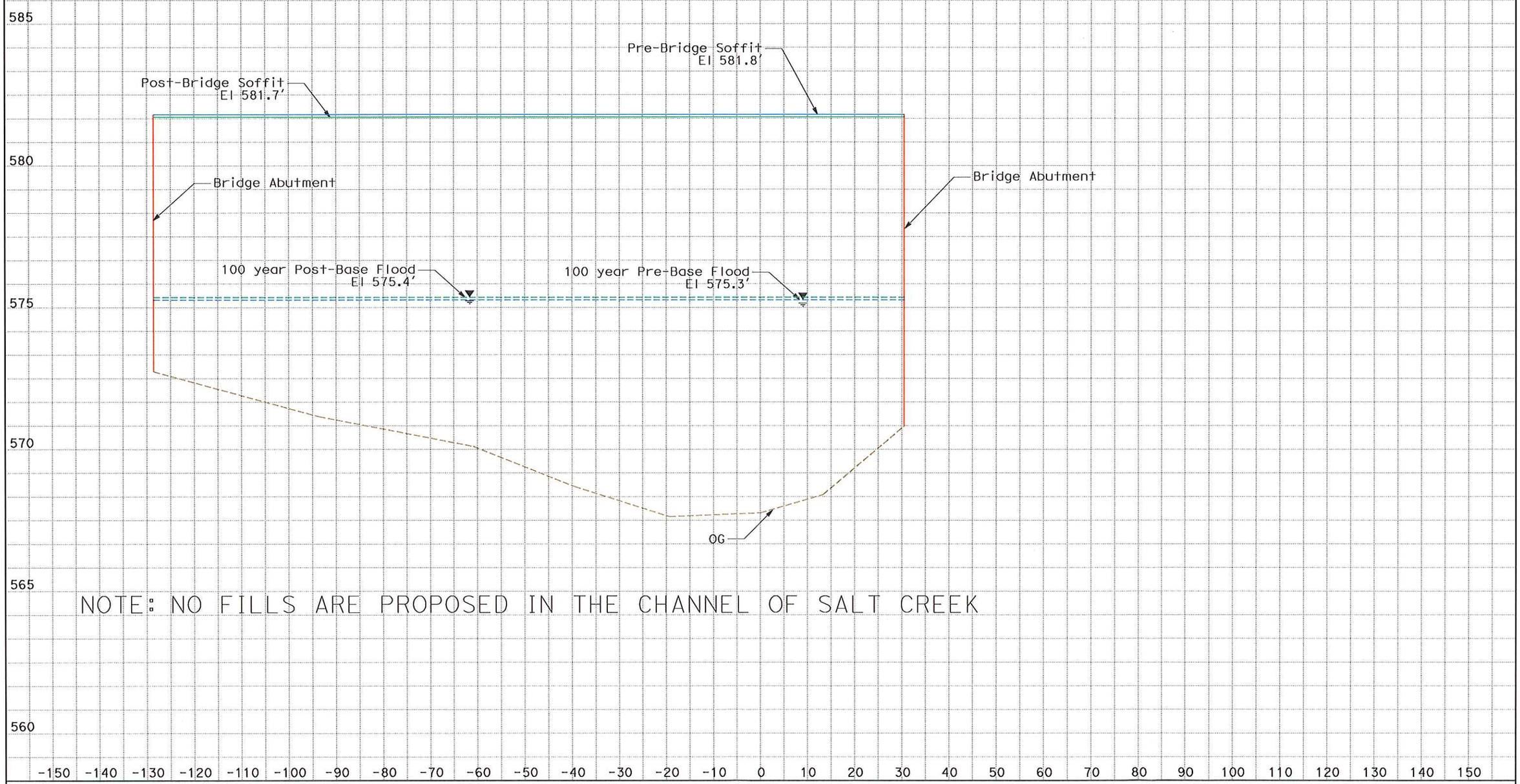
LAST REVISION 02-01-13
DATE PLOTTED => 14-MAR-2013
TIME PLOTTED => 15:43

P:\proj\02\36070\design\Project Engineer Files\430_Landscape\02-36070ge0018_Reveg_SaltCrk.dgn

BORDER LAST REVISED 7/2/2010 | USERNAME => s112529 | DGN FILE => 02-36070ge0018_Reveg_SaltCrk.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0383 | PROJECT NUMBER & PHASE 02000002621

Attachment C - Project Design Plans

SALT CREEK BRIDGE CROSS SECTION
(DOWNSTREAM SIDE OF STRUCTURE)



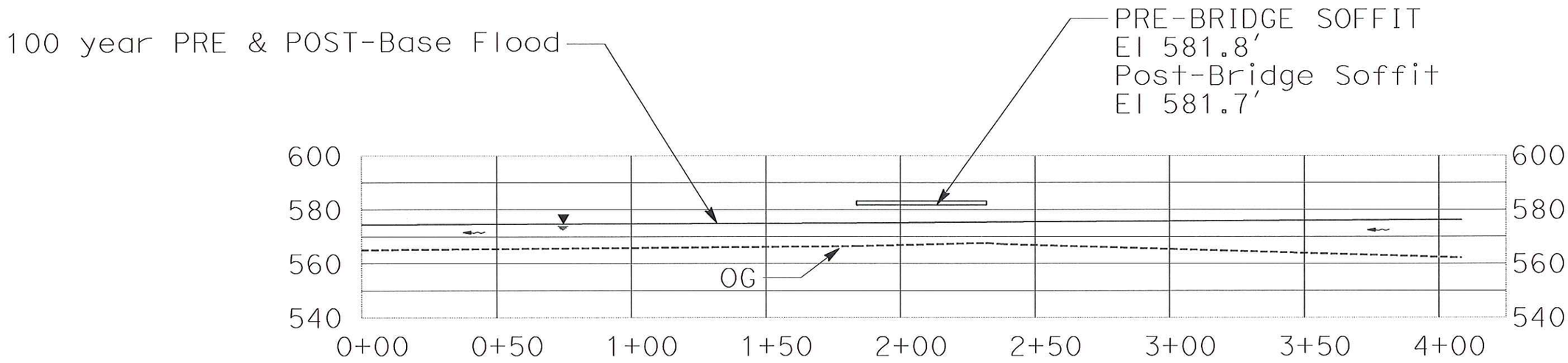
NOTE: NO FILLS ARE PROPOSED IN THE CHANNEL OF SALT CREEK

DATE: 11/16/12
KC Project: 20245 File: D:\projects\36070y45\salt crk.ear

All Dimensions are US Survey Feet

CS1
CROSS SECTIONS
Exhibit C1

SALT CREEK HYDRAULIC PROFILE



DATE: 5/9/2012
KC Project: 20245 File: D:\projects\36070y45\salt crk.ear

All Dimensions are US Survey Feet

CS1
PROFILE
Exhibit D1

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MIKE MOGEN
Project Engineer

Date: November 16, 2012

File: EA 02-360701
Project ID 02 0000 0262
Bella Diddy
Salt Creek Bridge
Br. No. 06-0049

From: TONY NEDWICK
Hydraulic Engineer
Division of Engineering Services
Hydrology and Hydraulics Branch

Subject: Revegetation at Salt Creek

The proposed revegetation for the Bella Diddy Project and the Salt Creek Bridge was accounted for in the hydraulic analysis. The Manning's roughness coefficients remained the same for existing and proposed conditions, to account for replacing existing vegetation in kind.

Any questions or concerns, I can be reached at (916) 227-8852.

Tony Nedwick, P.E.
Hydrology and Hydraulics Engineer
Caltrans Structures Hydraulics