INFORMATION HANDOUT

For Contract No. 08-0N56U4
At SBd-40-R94.7R/99.7 (PM)

Identified by
Project ID 0813000176

PERMITS

California Department of Fish and Wildlife

WATER QUALITY

California Regional Water Quality Control Board

Colorado River Basin

MATERIALS INFORMATION

Summary of Foundation Recommendation Reports

1. Foundation Report for Haller Wash Bridge (R/L), Project ID: 0813000176, Br. #54-1300 R/L dated August 5, 2013.

2. Foundation Report for Rojo Wash Bridge

3. Foundation Report for Clipper Valley Wash Bridge, Project ID: 0813000176, Br. #54-1302 R/L dated January 9, 2014.

4. Final Hydraulic Report for Haller Wash Bridge (Replace), Project No. 0813000176, Bridge No. 54-1300 R/L (Proposed) dated October 4, 2013.

5. Final Hydraulic Report for Rojo Wash Bridge (Replace), Project No. 0813000176, Bridge No. 54-1301 R/L (Proposed) dated October 24, 2013.

6. Final Hydraulic Report for Clipper Valley Wash Bridge (Replace), Project ID: 0813000176, Bridge No. 54-1302 R/L (Proposed) dated October 14, 2013.

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Inland Deserts Region
3602 Inland Empire Boulvard, Suite C-220
Ontarion, CA 91764
(909) 484-0167
www.wildlife.ca.gov

EDMUND G. BROWN, Jr., Governor
CHARLTON H. BONHAM, Director

May 29, 2014

Scott Quinnell
California Department of Transportation
464 West 4th Street, MS 822
San Bernardino, CA 92401

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2014-0025-R6
Haller Wash, Rojo Wash, and Clipper Valley Wash

Dear Mr. Quinnell:

Enclosed is the final Streambed Alteration Agreement (Agreement) for the Haller Wash, Rojo Wash, and Clipper Valley Wash Bridge Replacement Project (Project). Before the California Department of Fish and Wildlife (Department) may issue an Agreement, it must comply with the California Environmental Quality Act (CEQA). In this case, the Department, acting as a responsible agency, filed a notice of determination (NOD) on the same date it signed the Agreement. The NOD was based on information contained in the Mitigated Negative Declaration the lead agency prepared for the Project.

Under CEQA, filing a NOD starts a 30-day period within which a party may challenge the filing agency's approval of the project. You may begin your project before the 30-day period expires if you have obtained all necessary local, state, and federal permits or other authorizations. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Rebecca Jones, Environmental Scientist at (661) 285-5867 or Rebecca.Jones@wildlfife.ca.gov.

Sincerely,

for Leslie MacNair, Deputy Regional Manager
DEPARTMENT OF FISH AND WILDLIFE
Inland Deserts Region

cc: Rebecca Jones, Environmental Scientist

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
INLAND DESERTS REGION
3602 INLAND EMPIRE BOULEVARD, SUITE C-220
ONTARIO, CALIFORNIA 91764

STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2014-0025-R6
UNNAMED WASHES

CALIFORNIA DEPARTMENT OF TRANSPORTATION
INTERSTATE 40 HALLAR, ROJO, AND CLIPPER VALLEY WASH BRIDGE
REPLACEMENT PROJECT

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Wildlife (CDFW) and California Department of Transportation (Permittee) as represented by Mr. Scott Quinnell.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified CDFW on February 28, 2014 that Permittee intends to complete the project described herein.

WHEREAS, pursuant to FGC section 1603, CDFW has determined that the project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the project in accordance with the Agreement.

PROJECT LOCATION

The projects are located approximately 45 miles west of the city of Needles and approximately45 miles east of the town of Ludlow in the County of San Bernardino. The three locations are in Township 8 North, Ranges 15 &16, Sections 7, 8, and 10 in the San Bernardino meridian.

PROJECT DESCRIPTION

The proposed project includes the replacement of three bridges along Interstate 40 where it crosses over Haller Wash, Rojo Wash, and Clipper Valley Wash. Construction of the new bridges will be divided into two stages and will be required to construct a total of eight temporary detour roads in the median (four in each direction). The east bound bridges will be replaced first while traffic is detoured onto west bound during the first stage. The traffic will then be shifted onto the east bound (on newly constructed bridges) while the west bound bridges are being replaced. All the detour roads and temporary access roads will be removed and restored back to their original state. Access underneath the bridge structures will be necessary to install temporary support forms for demolition and construction of the new bridges. Access to the washes is anticipated through the median of the highway. Since construction crew will need to enter the washes and work under the bridges, there will be temporary impacts to the streambed; however, there will be no permanent impacts because the bridges will be replaced in-kind.

There may be a temporary concrete batch plant located within the median of Interstate 40 between the bridge locations in uplands. The determination of the need of a concrete batch plant and the final location will be determined by the contractor.

PROJECT IMPACTS

Existing fish or wildlife resources the project could substantially adversely affect include: **Reptiles:** desert tortoise (*Gopherus agassizii*), southern desert iguana (*Dipsosaurus dorsalis*), zebra-tailed lizard (*Callisaurus draconoides*), long-tailed brush lizard western (*Urosaurus graciosus*), side-blotched lizard (*Uta stansburiana*) whiptail (*Aspidoscelis* tigris); **Mammals:** desert kit fox (Vulpes macrotis arcipes), black-tailed jackrabbit (Lepus californicus), desert cottontail (Sylvilagus audubonii), Round-Tailed Ground Squirrel (*Xerospermophilus tereticaudus*), kangaroo rat (*Dipodomys sp*), coyote (*Canis latrans*), burro (*Equus asinus*), domestic cattle (*Bos* sp), desert woodrat (*Neotoma lepida*); **Birds:** burrowing owl (*Athene cunicularia*), red-tailed hawk (*Buteo jamaicensis*), greater goadrunner (Geococcyx californianus), Gambel's quail(Callipepla gambelii), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), Say's phoebe (*Sayornis saya*), loggerhead shrike (*Lanius ludovicianus*), verdin (*Auriparus flaviceps*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (Amphispiza bilineata); **Native Plants:** Nevada joint-fir (Ephedra nevadensis), burrobush (*Ambrosia dumosa*), Colorado Desert marigold (Baileya pauciradiata), woolly desert marigold (*Baileya pleniradiata*), sweetbush (*Bebbia juncea*), Fremont's pincushion (*Chaenactis fremontii*), black-banded rabbitbrush (*Chrysothamnus paniculatus*), Brittlebush (*Encelia farinose*), Virgin River encelia (Encelia virginensis), Cheesebush (*Ambrosia (Hymenoclea) salsola*), desert dalafox (*Palafoxia arida*), Parish's goldeneye (Bahiopsis (*Viguiera parishii*), Mojave-aster(Xylorhiza tortifolia), desert willow (*Chilpsis linearis*), checker fiddleneck (*Amsinckia tessellate*), narrow-leaved cryptantha (*Cryptantha angustifolia*), forget-me-not (*Cryptantha* sp.), cottontop cactus (*Echinocactus*

polycephalus var. polycephalus), hedgehog cactus (Echinocereus engelmannii), California barrel cactus (*Ferocactus cylindraceus*), beavertail cactus (*Opuntia basilaris*), silver/golden cholla (*Opuntia echinocarpa*), pencil cholla (*Opuntia (=Cylindropuntia) ramosissima*), coyote melon (*Cucurbita palmate*), rattlesnake weed (*Chamaesyce albomarginata*), small seeded spurge (*Chamaesyce polycarpa*), common ditaxis (*Ditaxis neomexicana*), catclaw (*Acacia greggii*), Mojave indigo-bush (*Psorothamnus arborescens* var. *arborescens*), indigo-bush (*Psorothamnus schottii*), smoke tree (*Psorothamnus spinosus*), spiny senna (*Senna armata*), white rhatany (*Krameria grayi*), chia (*Salvia columbariae*), sandpaper-plant (*Petalonyx* sp.), apricot mallow (*Sphaeralcea ambigua*), evening primrose (*Camissonia* sp.), desert plantain (*Plantago ovate*), Devil's Spineflower (*Chorizanthe rigida*), California Buckwheat (*Eriogonum fasciculatum var. polifolium),* Rose-and-White Wild Buckwheat (*Eriogonum gracillimum*), Desert Trumpet (*Eriogonum inflatum*), Turpentine-Broom *(Thamnosma montana),* Anderson Thornbush (*Lycium andersonii*), Desert Tobacco (*Nicotiana obtusifolia*), Desert Mistletoe (*Phoradendron californicum*), Creosote Bush (*Larrea tridentate*), Fluff Grass (*Erioneuron pulchellum*), Big Galleta (*Hilaria rigida),* desert needle grass (*Stipa speciosa)*; and other desert wash wildlife resources.

The adverse effects the project could have on the fish or wildlife resources identified above include: removal of vegetation, and construction of bridges. The project at will temporarily impact 5.87acres of desert wash habitat.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to CDFW personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, CDFW shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that CDFW personnel may enter the project site at any time to verify compliance with the Agreement.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

2.1 Pre-Construction Surveys. No more than 14 days prior to initiating construction activities, the qualified biologist shall conduct pre-construction surveys for state-listed Species of Special Concern, or threatened or endangered species and flag all potential burrows within the survey area which includes the Project footprint, a 50-foot buffer and all Project access routes. If the Project area boarders private property for which access has not been granted, buffer zone survey areas may be reduced; this Agreement does not authorize trespass. If state-listed threatened or endangered species are observed, CDFW shall be immediately notified by phone, and in writing no later than the following business day (refer to 'Contact Information' below). No state-listed threatened or endangered species shall be handled without obtaining a 2081 permit from CDFW.

2.2 On-site Biologist with Stop work Authorization. Permittee shall have a qualified desert tortoise biologist on-site during all Project activity to ensure Agreement conditions are being met and impacts to fish and wildlife habitat are minimized. The biologist shall have the authority to stop construction if necessary to protect fish and wildlife resources. If any state-listed Species of Special Concern, or threatened or endangered species, are observed in the Project area, the biologist shall inform CDFW. The biological monitor is also required to halt activities if state-listed threatened or endangered species are identified within the Project area and notify the appropriate agency representatives immediately, including Rebecca Jones, Environmental Scientist for CDFW. Consultation with CDFW is required prior to commencement of work following a stop work order.

2.3 Desert Tortoise. The work area shall be fenced with temporary desert tortoise fencing and resurveyed by the biologist. The fence shall be inspected daily. If a desert tortoise is found within the construction area, work shall cease immediately until the tortoise leaves on its own accord and CDFW will be notified within 24 hours. No tortoise shall be handled without obtaining a 2081 permit.

2.4 Environmental Education. All workers shall be given instruction in the protection of special-status species, including biology, occurrence, sensitivity and activity patters of the desert tortoise. Instruction shall also include legal protection and penalties for violation of state and federal laws.

2.5 Escape Ramp in Trench. At the end of each work day, Permittee shall place an escape ramp at each end of the open trench to allow any animals that may have become entrapped in the trench to climb out overnight. The ramp may be constructed

of either dirt fill or wood planking or other suitable material that is placed at an angle no greater than 30 degrees.

2.6 Notification to the California Natural Diversity Database. If any special status species are observed in project surveys, Permittee or designated representative shall submit Natural Diversity Data Base (NDDB) forms to the NDDB for all preconstruction survey data within five (5) working days of the sightings, and provide to CDFW's Regional office three (3) copies of the NDDB forms and survey maps.

2.7 Biological Monitor. A biological monitor is an individual experienced with construction level biological monitoring and who is able to recognize species in the project area and who is familiar with the habits and behavior of those species. Biological monitors shall have academic and professional experience in biological sciences and related resource management activities as it pertains to this project. All biological monitors for the project shall be approved by CDFW prior to commencement of covered activities.

2.8 Special Status Species encountered during work. If Permittee encounters special status species during the conduct of Project Activity, work shall be suspended, CDFW notified, and conservation measures shall be developed in agreement with CDFW prior to re-initiating the activity.

2.9 Bat Protection - Bridges. Prior to work commencing at any bridge, the bridge shall be surveyed for bats by a qualified bat biologist. If bats are found work on the bridge operations shall cease. Bats shall not be disturbed without specific notice to and consultation with CDFW. Department reserves the right provide additional provisions to this agreement designed to protect nesting/roosting bats. *Bat surveys shall be conducted prior to project commencement. Impact minimization measures shall be implemented prior to project activities. If the bridge is being replaced, new bat habitat shall be incorporated in the design of the new bridge.*

2.10 Vegetation Removal and Nesting Birds. The Permittee shall not remove vegetation from the Project area from February 15 to September 1 to avoid impacts to nesting birds. If the Permittee intends to commence Project construction between February 15 and September 1, the Permittee shall have a qualified biologist survey all potential nesting vegetation for nesting birds within the Project area, prior to Project activities (including construction and/or site preparation). Surveys shall be conducted at the appropriate time of day during the breeding season, and surveys shall end no more than three days prior to clearing. If nesting birds are not observed during nesting bird surveys, then Project activities may begin immediately after conclusion of the surveys. If an active nest is observed within the Project area, the onsite biological monitor will establish, in coordination with CDFW, an appropriate buffer around the active nest(s). If

avian species are observed nesting in the Project area, no work shall occur during the avian breeding season (February 15 through September 1) without Department authorization.

2.11 Migratory Birds and Raptors. Permittee shall comply with Sections 3503, 3503.5, and 3513 of the California Fish and Game Code which prohibits take of all birds and their active nests, including raptors and other migratory nongame birds (as listed under the Migratory Bird Treaty Act).

2.12 Stream Materials. Rock, gravel, and/or other materials shall not be imported to, taken from or moved within the bed or banks of the stream except as otherwise addressed in this Agreement.

2.13 Alluvium Fill. Fill construction materials other than on site alluvium, shall consist of clean silt free gravel or river rock.

2.14 Bank Stabilization. Permittee shall construct bank stabilization with suitable non-erodible materials that will withstand wash out. The bank stabilization material shall extend above the normal high-water mark. Only clean material such as, rock riprap that is free of trash, debris and deleterious material shall be used as bank stabilization. Asphalt shall not be considered an acceptable material.

2.15 Restore Banks and Channel Material. Permittee shall return stream channel as near as possible to pre-project conditions. The gradient of the streambed shall be returned to pre-project grade. With the exception of vegetation directly in the trench excavation area, vegetation within the stream which proves to be an obstruction to normal operations, should be trimmed only as pre-approved by CDFW.

2.16 Concrete Placement. Any concrete place in the stream channel shall be allow to dry a minimum for 24 hours prior to inundation with water.

3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

3.1 Impacts to wash habitat will be mitigated for at a 3:1 ratio. The acquired habitat should be predominately desert wash scrub.

3.2 Habitat Mitigation and Monitoring Plan (HMMP). **No later than 60 days after the execution of this Agreement**, Permittee shall submit to CDFW for review and approval a HMMP for the .20 acres habitat creation site. At a minimum, the HMMP shall include the following information: (a) a description of the existing physical

conditions of the proposed creation or restoration site, including water resources and habitat types, and a map that identifies the location of the site; (b) a plan for the preparation of the creation or restoration site, including the removal of nonnative plant species, non-wetland/riparian plant species, and grading; (c) a local California native plant palette; (d) a planting plan, including monitoring and maintenance measures and a timeline; (e) an irrigation plan; (f) procedures to ensure that nonnative plants are not introduced or allowed to sustain within the creation or restoration site and a nonnative plant removal plan; and (g) success standards with contingency measures. Monitoring and maintenance of the creation or restoration site shall be conducted annually for a minimum of five years, or until DFG determines the mitigation site is successful.

3.3 Vegetation Replacement. Any smoke trees, catclaws or desert willows with a diameter breast height of 2 inches or greater, are impacted by the project they shall be replaced at a 3:1 ratio within the wash area. If any of these trees are removed, CDFW shall be notified of the number and size of each tree, prior to grading.

4. Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 Notification to the California Natural Diversity Database. If any special status species are observed in project surveys, Permittee or designated representative shall submit Natural Diversity Data Base (NDDB) forms to the NDDB for all preconstruction survey data within five (5) working days of the sightings, and provide to CDFW's Regional office three (3) copies of the NDDB forms and survey maps.

4.2 Notification of Start of Construction. Permittee shall notify CDFW, in writing, at least five (5) days prior to initiation of Project activities in jurisdictional areas, and at least five (5) days prior to completion of Project activities in jurisdictional areas. Notification should be mailed to Department of Fish and Wildlife, Inland Deserts Region at the address below under Contact Information. **Please reference SAA # 1600-2014-0025-R6.**

CONTACT INFORMATION

Any communication that Permittee or CDFW submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or CDFW specifies by written notice to the other.

To Permittee:

Mr. Scott Quinnell
California Department of Transportation
464 West 4th Street, Mailstop 822
San Bernardino, CA 92401

Scott.quinnell@dot.ca.gov

To CDFW:

Department of Fish and Wildlife
Inland Deserts Region
3602 Inland Empire Boulevard, Suite C-220
Ontario, CA 91764
Attn: Lake and Streambed Alteration Program – Rebecca Jones
Notification #1600-2013-0164-R6
(661) 285-5867
Rebecca.Jones@wildlife.ca.gov

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute CDFW's endorsement of, or require Permittee to proceed with the project. The decision to proceed with the project is Permittee's alone.

SUSPENSION AND REVOCATION

CDFW may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before CDFW suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before CDFW suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused CDFW to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes CDFW from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects CDFW's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 *et seq.* (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

CDFW may amend the Agreement at any time during its term if CDFW determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by CDFW and Permittee. To request an amendment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter CDFW approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to CDFW a completed CDFW "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in CDFW's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). CDFW shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the project the Agreement covers (FGC section 1605(f)).

EFFECTIVE DATE

The Agreement becomes effective on the date of CDFW's signature, which shall be: 1) after Permittee's signature; 2) after CDFW complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.wildlife.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on December 31, 2015, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

AUTHORIZATION

This Agreement authorizes only the project described herein. If Permittee begins or completes a project different from the project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify CDFW in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR California Department of Transportation

Scott Quinnell — 5-28-14

Mr. Scott Quinnell — Date

FOR DEPARTMENT OF FISH AND WILDLIFE

5,29,14

for Leslie McNair — Date

Environmental Program Manager

Prepared by: Rebecca Jones
Environmental Scientist

California Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

Colorado River Basin Regional Water Quality Control Board

May 2, 2014

Mr. Scott Quinnell
California Department of Transportation (Caltrans)
464 West 4th Street, Mailstop 822, 6th floor
San Bernardino, CA 92401

RE: ORDER FOR TECHNICALLY-CONDITIONED CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION FOR DISCHARGE OF DREDGED AND/OR FILL MATERIALS

PROJECT: This federal Clean Water Act Section 401 Water Quality Certification (WQC) (33 U.S.C. § 1341) is written for Caltrans - Interstate 40 Haller, Rojo, and Clipper Valley Wash Bridge Replacements, WDID NO. 7A363021001

APPLICANT: California Department of Transportation

ACTION:

1. ☐ Order for Standard Certification
2. ☒ Order for Technically-Conditioned Certification
3. ☐ Order for Denial of Certification

STANDARD CONDITIONS:

The following standard conditions apply to <u>all</u> certification actions, except as noted above under Action 3 for denials.

1. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to section 13330 of the California Water Code and section 3867 of Title 23 of the California Code of Regulations (23 CCR).

2. This certification action is not intended and shall not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to 23 CCR

section 3855(b) and the application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. The validity of any non-denial certification action (Actions 1 and 2) shall be conditioned upon total payment of the full fee required under 23 CCR section 3833, unless otherwise stated in writing by the certifying agency.

4. In the event of any violation or threatened violation of the conditions of this certification, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under State law. For purposes of Clean Water Act (CWA) section 401(d), the applicability of any State law authorizing remedies, penalties, process, or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into this Water Quality Certification (WQC).

   a. In response to a suspected violation of any condition of this WQC, the Colorado River Basin Regional Water Quality Control Board (Colorado River Basin Water Board) may require the holder of any permit or license subject to this certification to furnish, under penalty of perjury, any technical or monitoring reports the Colorado River Basin Water Board deems appropriate, provided that the burden, including cost of the reports, shall be in reasonable relationship to the need for the reports and the benefits to be obtained from the reports.

   b. In response to any violation of the conditions of this WQC, the Colorado River Basin Water Board may add to or modify the conditions of this certification as appropriate to ensure compliance.

ADDITIONAL CONDITIONS:

The following additional conditions apply to this certification:

1. This WQC applies towards the proposed project (Project) as described in a 401 application received by the Colorado River Basin Water Board on February 26, 2014. Updated information was received on April 28, 2014.

2. The Applicant shall provide the Colorado River Basin Water Board and other interested agencies with written notification of any significant modifications made to the Project prior to implementation of the modifications.

3. This WQC does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

4. This WQC does not authorize the Applicant or any associated party to trespass on any land or property unless the applicant has obtained written authorization or acquired a special use authorization permit from the land or property owner.

5. A copy of this WQC shall be provided to the appropriate onsite Supervisor for the Project. All personnel performing work on the proposed Project shall be familiar with the content of this WQC. Copies of the WQC shall be readily available at the Project site at all times during periods of active work and shall be presented to regulatory agency representatives upon request.

6. The Applicant shall grant Colorado River Basin Water Board staff, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to enter the Project site at reasonable times, to ensure compliance with the terms and conditions of this WQC and/or to determine the impacts the Project may have on waters of the United States.

7. The proposed Project shall not be enlarged or extend beyond the proposed Project impact area. The Applicant shall delineate the Project boundaries and staging areas with stakes, flags and/or temporary construction fencing.

8. The area of vegetation and soil disturbance shall be restricted to the smallest extent possible.

9. The Project shall not discharge substances in concentrations toxic to human, plant, animal, or aquatic life or that produce detrimental physiological responses.

10. The Project shall not discharge waste classified as "hazardous" as defined in Title 23 California Code of Regulations (CCR) section 2521, California Health and Safety Code section 25140, and Title 22, CCR, section 66260.10 et seq.

11. No oil, petroleum products, or rubbish shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the United States.

12. No equipment maintenance will be done within or near any stream channel where petroleum products or other pollutants from the equipment may enter waters of the United States.

13. Equipment refueling shall not occur within waters of the United States.

14. Any oil or grease leaks shall be immediately cleaned up.

15. The Applicant shall ensure that all contaminated material and/or contaminated soil removed or excavated from the Project site is properly loaded, transported, and disposed of in accordance with Federal, State, and local regulations.

B1030 16. Staging/storage areas for equipment and materials shall be located outside of waters of the United States.

B1021 17. The Applicant shall ensure that all disturbed and filled areas are adequately stabilized and protected from erosion and siltation by implementing appropriate soil stabilization, sedimentation and silt control measures.

B1031 18. Any flow diversion used during construction shall be designed in a manner to prevent pollution, minimize siltation, and shall provide flows to downstream reaches. Flows shall be maintained to support existing aquatic life and riparian wetlands and habitat that may be located upstream and downstream from any temporary diversion.

B1022 19. The Applicant shall restore drainages, to the greatest extent possible, to the original bank configuration, stream bottom width, and channel gradient.

B1022 20. All temporary facilities and impacts shall be removed and restored to the preexisting conditions and contours to the extent practicable.

B1032 21. Construction related materials and wastes shall be removed from the Project site upon completion of the Project.

B1033 22. The Applicant shall submit Notice to the Colorado River Basin Water Board within 60-days of completion of the Project. The Notice shall include: 1) a detailed summary of the mitigation and restoration activities implemented during the Project and 2) provide photographic documentation that supports the information summarized in the Notice.

B1034 23. The Colorado River Basin Water Board reserves the right to suspend, cancel, or modify and reissue this WQC, after providing notice to the Applicant and/or responsible Site-Supervisor, if the Colorado River Basin Water Board determines that the Project fails to comply with any of the terms or conditions of this WQC.

B1035 24. The Applicant shall orally notify the Colorado River Basin Water Board of any noncompliance that may impact the beneficial uses of waters of the United States, as soon as notification is possible and notification can be provided without substantially impeding measures necessary to address the noncompliance.

REGIONAL WATER QUALITY CONTROL BOARD CONTACT PERSON:

If you have any questions, please contact Jay Mirpour, Water Resources Control Engineer, at (760) 776-8981 or jmirpour@waterboards.ca.gov.

WATER QUALITY CERTIFICATION:

I hereby issue an order certifying that any discharge from the referenced Project will comply with the applicable provisions of sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law.

Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the applicants' Project description and the attached Project Information Sheet, and (b) compliance with all applicable requirements of the Colorado River Basin Water Board's Water Quality Control Plan (Basin Plan).

Robert A. Perdue

ROBERT PERDUE, Executive Officer
Colorado River Basin Regional Water Quality Control Board

JJM/

cc: James Mace, U.S. Army Corps of Engineers, Los Angeles District
Bill Orme, SWRCB, Division of Water Quality, Water Quality Certification Unit
Elizabeth Goldmann, U.S. Environmental Protection Agency, Region 9
Thomas A. Vandenberg, Office of Chief Counsel, SWRCB

File: Caltrans - Interstate 40 Haller, Rojo, and Clipper Valley Wash Bridge Replacements, WDID NO. 7A363021001

PROJECT INFORMATION

Application Date: This WQC applies towards the proposed project (Project) as described in a 401 application received by the Colorado River Basin Water Board on February 26, 2014. Updated information was received on April 28, 2014.

Applicant: Caltrans
Contact: Mr. Scott Quinnell, (909) 383-6936

Applicant Representative: Caltrans
Contact: Mr. Josh Jaffery, (909) 383-6386

Project Name: Caltrans - Interstate 40 Haller, Rojo, and Clipper Valley Wash Bridge Replacements, WDID NO. 7A363021001

Start and Completion: Startup: 11/15/2014
Duration: 3 years, 9 months
Completion: 7/23/2018

Project Description: Caltrans proposes to replace the bridges located along Interstate 40 crossing over Haller Wash, Rojo Wash, and Clipper Valley Wash. There may be a temporary concrete batch plant located within the median of Interstate 40 between the bridge locations in uplands. The determination of the need of a concrete batch plant and the final location will be determined by the contractor and not Caltrans.

Construction of the new bridges will be divided into two stages and will be required to construct a total of eight temporary detour roads in the median (four in each direction). The east bound bridges (right bridges) will be replaced first while traffic is detoured onto west bound during the first stage. The traffic will then be shifted onto the east bound (on newly constructed bridges) while the west bound bridges (left bridges) are being replaced. All the detour roads and temporary access roads will be removed and restored back to its original state. Access underneath the bridge structures will be necessary to install temporary support forms for demolition and construction of the new bridges. Access to the washes is anticipated through the median of the highway. Since construction crews will need to enter the washes and work under the bridges, there will be temporary impacts to the

streambed; however, there will be no permanent impacts because the bridges will be replaced in-kind.

Project Location: City or area: Near Essex, San Bernardino County, California.
Longitude/Latitude: -115.34550, 34.80349
Township/Range: Township 8 North, Ranges 15 and 16 East, San Bernardino Base Meridian

Receiving Water(s): Haller Wash, Rojo Wash, and Clipper Wash

Acres and Linear Feet Impacted: 0.0 acre permanent and 5.87 (temporary) acres
0.0 acre permanent and 1,474 (temporary) linear feet streambed (unvegetated)

Standard Best Management Practices (BMPs):

- No toxic and/or hazardous materials shall be stored near or within wash/drainage areas. To extent possible, these materials will be offsite and/or placed in appropriate secondary containment.

- Work and staging areas and temporary access routes will be sized, located and flagged so as to limit potential impacts to natural areas. Previous disturbed areas will be used to the extent feasible.

- No fueling or maintenance of equipment and/or vehicles shall occur adjacent or within the wash/drainage areas.

- Spoil sites shall not be located where spoil could be washed back into the river, or where spoil will cover aquatic or riparian vegetation. Any materials placed in seasonally dry portions of the canal/ drainage areas that could be washed downstream or could be harmful to aquatic life shall be removed from the streambed prior to inundation by high flows.

- After completing the activities, the disturbed area will be restored to pre-existing contours and conditions to the extent feasible.

Additional Site Specific BMPs:

The project is for the replacement of three bridges and is confined to the bridges' existing locations. Therefore, alternative locations for the project that would avoid all impact to waters were infeasible. Redesigning of the project to completely avoid all impacts to waters was investigated; however, it was determined that replacement of the bridges was not practical without temporary impacts to the streambed.

The following storm water BMPs will be utilized: 2,400 linear feet of temporary silt fence, 4,890 linear feet of temporary fiber rolls, 1,500 cubic yards of temporary construction roadway, a temporary concrete washout facility, and eight temporary construction entrances.

The following temporary construction site BMPs will be utilized: water conservation practices, dewatering operations, paving and grinding operations, vehicle and equipment fueling, vehicle and equipment cleaning, vehicle and equipment maintenance, pile driving operations, concrete curing, material and equipment use over water, concrete finishing, structural demolitions/removal over or adjacent to water, material delivery and storage, material use, stockpile management, spill prevention and control, solid waste management, hazardous waste management, and sanitary/septic waste management.

Post-construction BMPs are not needed because once construction is complete, the project will not create any new net impervious areas or new sources of stormwater pollutants.

Federal Permit(s): U.S. Army Corps of Engineers Section 404 Nationwide Permit No. 14: Linear Transportation Projects

Status of CEQA: Lead Agency: Caltrans, State Clearinghouse Number: 2014031029. Notice of Determination filed with the County Clerk and State Clearinghouse on April 25, 2014 that the project would have no significant effect on the environment.

File: Caltrans - Interstate 40 Haller, Rojo, and Clipper Valley Wash Bridge Replacements, WDID NO. 7A363021001

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: HOWARD NG
Office of Bridge Design–South 2
Design Branch 20
Diamond Bar, CA

Attention: Mr. Mohammad Muqtadir

Date: August 5, 2013

File: 08-SBd-40-PM 95.14
08-0N56U1
Proj. ID: 0813000176
Haller Wash Bridge
(Replacement)
Br. #54-1300 R/L

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN – SOUTH 2
DESIGN BRANCH B, MS #5

Subject: Foundation Report for Haller Wash Bridge (R/L)

This report presents the foundation recommendations for the proposed Haller Wash Right and Left Bridges (Br. No. 54-1300 R/L), which will replace the existing Haller Wash Right and Left Bridges (Br. No. 54-0891 R/L). This report supersedes all previously generated preliminary foundation reports that may have been written for the structures. The following foundation recommendations are based on subsurface information gathered during the 2013 subsurface investigation performed by Caltrans, a review of "As-built" Log of Test Boring (LOTB) data from a 1969 subsurface investigation, the March 21, 1969 Foundation Report for the structures, and information associated with a 2009-2010 girder strengthening project for various box girder bridges along I-40 in the area. All elevations referenced within this report are based on the NAVD 1929 vertical datum, unless otherwise indicated.

Project Description/History

The existing Haller Wash right and left bridges are located on Interstate 40 in San Bernardino County approximately 100 miles east of Barstow, California and approximately 45 miles west of Needles, California. The right and left bridges were completed in 1973 and consist of two-span, reinforced concrete, box girder structures with end-diaphragm abutments. In March 2006, during scheduled bridge inspections, it was found that a nearby T-girder bridge structure (Mustang Wash right bridge) had significant problems with vertical shear failures in the girders, and horizontal shear failures between the girders and bridge deck. It was found that many bridges along the I-40 corridor were constructed using reactive aggregate concrete, which was contributing to the structural deterioration. Consequently, inspections were made of 45 T-girder structures along the I-40 corridor. In total, twelve bridges were identified as having the same structural problem, all of which were built in 1973 under the same contract. Consequently, the twelve bridges were replaced in 2007, under an emergency contract.

Due to the rapid failure of the T-girder structures, Caltrans Structure Maintenance & Investigation moved quickly to look at the other bridges on the I-40 corridor. It was found that the box girder structures in the same area were also constructed using the same reactive aggregate concrete used in the T-girder structures, and several of these box-girder bridges were also experiencing similar structural deterioration, but at a slower rate. In 2009/2010, girder strengthening work was performed on eight of the box-girder bridges. Currently, nine box-girder structures have been identified for replacement, including Haller Wash right and left bridges.

Site Geology

The proposed bridge site is located in the Mojave Desert on the eastern side of Clipper Valley, approximately 45 miles west of Needles, California, and spans the shallow Haller Wash. The "Geologic Map of California, Needles Sheet" (Jenkins, 1992) shows the site is underlain by Quaternary Alluvium of an alluvial fan that originates at the base of the Clipper Mountains, located south of the bridge site, and generally slopes toward the north at the bridge location. The Clipper Mountains are generally composed of Precambrian gneiss along the northwestern and northeastern sides of the mountain range, and Tertiary volcanics in the center and southern parts of the mountain range.

The foundation investigation, completed in May 2013, consisted of 4 mud rotary borings. Those borings revealed the site is underlain by alluvial material consisting of very dense silty sand with gravel; and poorly–graded sand with silt, with igneous and metamorphic cobbles and boulders.

Ground Water

No ground water was encountered during the May 2013 subsurface investigation. Due to the Haller Wash bridges being located in an extremely arid environment, it is anticipated that ground and surface water would only be present during brief wet periods.

Scour Potential

Flowing surface water may be present at the site during brief wet periods. The scour data shown in Table 1 was provided by the Office of Bridge Design-South 2 on July 10, 2013.

Table 1. Scour Data

Support Location		Long Term Scour (Degradation and Contraction) Elevation (ft)	Short Term Scour (Local) Depth (Ft)
Left Bridge	Abut 1	2285.6	3
	Abut 2	2285.1	3
Right Bridge	Abut 1	2291.9	3
	Abut 2	2291.6	3

Corrosion

Corrosion test results for soils samples collected from boring RC-13-001 are shown in Table 2 below. All of the soil samples tested are considered non-corrosive by current Caltrans standards.

Table 2. Corrosion Test Summary

Location	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
Boring RC-13-001 Elev. 2292.9 – 2252.9 ft	1160	7.86	-	-

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 2000 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site is potentially subject to ground motions from nearby earthquake sources during the design life of the new structure. For the deterministic procedure, the controlling fault for the site is the Pisgah-Bullion fault zone (East Bullion section – southeast) (Fault ID: 319, strike-slip, dip=90 deg.) with a maximum credible earthquake Mw = 7.2, located approximately 51.3 miles from the site. For this site, the design response spectrum is controlled by a minimum deterministic response spectrum for periods below 1-second, and probabilistic response spectrum beyond the period of 1-second. The average shear wave velocity for the upper 100 ft of the subsurface materials is estimated as V_{s30} = 450 m/s. The corresponding peak horizontal ground acceleration (PGA) at the site is 0.22g. The Office of Geotechnical Design-South 2 has provided Final Seismic Design Recommendations for the site in a report dated August 5, 2013, which will be forwarded to your office.

Surface Rupture Potential

The site is not located within the Earthquake Fault Hazard Zone in California. Therefore, the potential for surface fault rupture hazard is considered low.

Liquefaction Potential

Due to the dense nature of the alluvial material underlying the site, as well as the expected absence of high ground water table, the liquefaction potential at the site is anticipated to be low. Liquefaction potential will be addressed in the Final Seismic Design Report.

"As-built" Information

The existing Haller Wash right and left bridges are approximately 140 ft long and 42 ft wide. Abutments 1, 3, and Pier 2 are supported on spread footings for both bridges. Table 3, below, presents the "As-built" spread footing information.

Table 3. "As-built" Spread Footing Data (Br. #54-0891 R/L)

Support Location		Footing Width (ft)	Bottom of Footing Elevation (ft)	Allowable Footing Pressure (tsf)	Design Footing Pressure (tsf)
Right Bridge	Abut 1& 3	3.0	2289.0	2.0	1.9
	Pier 2	5.0	2269.0	4.0	3.9
Left Bridge	Abut 1 & 3	3.0	2282.0	2.0	1.9
	Pier 2	5.0	2263.0	4.0	3.9

Foundation Recommendations

The following Foundation Recommendations are for the Haller Wash Bridge R/L (Replacement) as shown on the General Plan, dated June 26, 2013. At Abutments 1 and 2, of the left and right bridges, spread footings are recommended for support, with the bottom of footings founded in the underlying dense native alluvial material. The foundation design at the abutment locations is based on working stress design (WSD). The information shown in Tables 4 and 5, below, is based on specific foundation design information provided by the Office of Bridge Design-South 2 on July 10, 2013.

Table 4. Foundation Data Provided by Structure Designer

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Left Bridge	Abut 1	WSD	2294.0	2277.8	11.0	47.2	2
	Abut 2	WSD	2293.7	2277.8	11.0	47.2	2
Right Bridge	Abut 1	WSD	2300.7	2284.5	11.0	47.2	2
	Abut 2	WSD	2300.5	2284.5	11.0	47.2	2

Table 5. LRFD Service Limit State I Information Provided by Structure Designer

Support Location		Total Load					Permanent Load			
		Vertical Load (kip)	Effective Dimensions (ft)		Gross Uniform Bearing Stress (q_o) (Kip)	Horizontal Load in Long. Direction (kip)	Vertical Load (kip)	Effective Dimensions (ft)		Gross Uniform Bearing Stress (q_o) (Kip)
			B'	L'				B'	L'	
Left Bridge	Abut 1	1872	8.9	47.2	4.5	429	1609	8.5	47.2	4.0
	Abut 2	1863	8.9	47.2	4.5	429	1600	8.6	47.2	4.0
Right Bridge	Abut 1	1871	8.9	47.2	4.5	429	1608	8.5	47.2	4.0
	Abut 2	1865	8.9	47.2	4.5	429	1602	8.6	47.2	4.0

The recommended Permissible Gross Contact Stress (q_{pg}) and Allowable Gross Bearing Capacities (q_{all}), and bottom of footing elevations are listed below in Table 6.

Table 6. Abutments 1 and 2 Foundation Design Recommendations

Support Location		Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	WSD (LRFD Service I Limit State Load Combination)	
		B	L			Permissible Gross Contact Stress (ksf)	Allowable Gross Bearing Capacity (ksf))
Left Bridge	Abut 1	11.0	47.2	2277.8	5.0	13.5	4.5
	Abut 2	11.0	47.2	2277.8	5.0	13.5	4.5
Right Bridge	Abut 1	11.0	47.2	2284.5	5.0	13.5	4.5
	Abut 2	11.0	47.2	2284.5	5.0	13.5	4.5

The recommended Allowable Gross Bearing Capacities to be used for design, provided in Table 6 above, are based on the following design criteria:

1) The final designed spread footing will have an effective footing area (B' x L') such that the Gross Uniform Bearing Stress (q_o) does not exceed the recommended design value for the Permissible Gross Contact Stress (q_{pg}) for Service-I Limit State (Settlement).

2) The final designed spread footing will have an effective footing area (B' x L') such that the Gross Uniform Bearing Stress (q_o) does not exceed the recommended design values for the Allowable Gross Bearing Capacity (q_{all}) for Service-I Limit State (Bearing Capacity).

3) The spread footings are to be constructed at or below the recommended bottom of footing elevations and maintain the minimum footing embedment depths, as show in Table 6.

If any of the above loading conditions are changed, minimum footing widths or embedment depths are reduced, or bottom of footing elevations raised, the Office of Geotechnical Design-South 2, Branch B, is to be contacted for reevaluation.

General Notes:

1) All support locations are to be plotted in plan view on the Log of Test Borings as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations:

1) At Abutments 1 and 2 support locations of the left and right bridges, concrete for the proposed support footings shall be placed neat against the undisturbed dense native alluvial material at the bottom of the footing excavation. Should the bottom of the footing

excavation be disturbed, then the disturbed soils shall be recompacted to 95% relative compaction (RC) prior to placement of steel or concrete for the structure support footing.

2) At Abutments 1 and 2 support locations, for the left and right bridges, the footing excavations are to be inspected and approved by a representative of the Office of Geotechnical Design-South 2, Branch B, prior to placing any steel, structural concrete, and, if required, disturbed soil that has been recompacted to 95% RC. The required inspection is to verify that the concrete is placed on top of undisturbed dense native material. Once the excavation has been completed to the specified elevations, the contractor is to allow the Office of Geotechnical Design-South 2, Branch B, seven (7) calendar days to perform the inspection. The structures representative is to provide the Office of Geotechnical Design-South 2, Branch B, a one-week notification prior to beginning the seven calendar day contractor waiting period.

This Foundation Report is based on specific project information that has been provided by the Office of Bridge Design, Design Branch 20. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South 2, Design Branch B should review those changes to determine if this report is still applicable. Any questions regarding the above report should be directed to the attention of David TM Liao, (916) 227-5756, Erich Neupert, (916) 227-4565, or Mark DeSalvatore, (916) 227-5391 at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 8/5/13

Erich Neupert

Erich Neupert, P.G. #8137
Engineering Geologist
Office of Geotechnical Design-South 2
Design Branch B

Supervised by: Date: 8/5/13

Mark DeSalvatore, P.E.#39499
Senior Materials & Research Engineer
Office of Geotechnical Design-South 2
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REGISTERED PROFESSIONAL ENGINEER
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CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File
John Stayton-Specs and Estimates
Mohammad Mollazadeh- Dist. 8 Project Manager
Bruce Kean-Dist. 8 Materials Engineer
Abbas Abghari-OGDS2
Geotechnical Archive

State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

Flex your power!
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To: MR. BARTT GUNTER
Branch Chief
Structure Design Branch 19
Office of Bridge Design South 2

Date: January 14, 2014

File: 08-SBD-40-PM 98.3
08-0N56U1
Proj. ID: 0813000176
Rojo Wash Bridge (Replace)
Br. #54-1301 R/L

Attention: Mr. Charles Lomicka

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2
Design Branch B

Subject: Foundation Report for Rojo Wash Bridge

In a memorandum dated March 12, 2013, Structures Design, Office of Bridge Design Branch 19 requested a Foundation Report (FR) for the proposed replacement of Rojo Wash left and right bridges (Br. No. 54-1301 R/L). This FR supersedes all previously generated Preliminary Foundation Reports for this structure. The following recommendations are based on subsurface information gathered during the 2013 subsurface investigation performed at the site.

With regards to the current foundation recommendations, all elevations referenced within this report and shown on the recent Log of Test Boring sheets are based on the NGVD 1929 vertical datum.

Project Description

The Rojo Wash Bridges (Br. No. 54-1301 R/L) are located in San Bernardino County on State Route 40 approximately 44 miles west of Needles, California. The proposed right and left bridge structures will consist of a two-span, pre-cast, pre-stressed, post-tensioned concrete girder structure on seat type abutments.

Geology

The "Geologic Map of the San Bernardino Quadrangle, San Bernardino County, California (Revised 1998, Bortugno and Spittler)" indicates that the site is located on Quaternary Alluvium which consists of dissected and undifferentiated alluvium deposits, colluvium and fan conglomerate.

The 2013 subsurface investigation consisted of 6 mud-rotary soil borings. The soil borings revealed the site is underlain mainly by layers of dense to very dense poorly-graded and well-

graded sands with silt and silty sands, to the maximum explored depth of 52.5 feet (Elev. 2097.8 feet). For more detail, please refer to the Log of Test Borings.

Ground Water

No ground water was encountered during the 2013 subsurface investigation. Due to the Rojo Wash bridges being located in an extremely arid environment, it is anticipated that surface water would only be present in the wash during brief wet periods.

Scour Potential

Structure Hydraulics and Hydrology has provided a Final Hydraulic Report in a memorandum dated October 24, 2013, which states that Rojo Wash has a potential for scour. The scour data presented in the report is shown in Tables 1 and 2 below. Please refer to that memorandum for more specific information.

Table 1 - Scour Data Left Bridge (54-1301 L)

Support Location	Long Term Scour (ft)		Short Term Scour (Local) Depth (ft)	Scour Elevation (ft)
	Degradation	Contraction		
Abutment 1	0	0	N/A	N/A
Pier 2	1	0	10.5	2133.5
Abutment 3	0	0	N/A	N/A

Table 2 - Scour Data Right Bridge (54-1301 R)

Support Location	Long Term Scour (ft)		Short Term Scour (Local) Depth (ft)	Scour Elevation (ft)
	Degradation	Contraction		
Abutment 1	0	0	N/A	N/A
Pier 2	1	0	10.5	2144.0
Abutment 3	0	0	N/A	N/A

Corrosion

Corrosion test results are shown below in Table 3. The tested soil sample was taken from soil boring RC-13-001. Test results indicate the soil sample is considered non-corrosive by current Caltrans standards.

Table 3 - Corrosion Test Summary

Location	SIC Number	pH	Minimum Resistivity (Ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
RC-13-001 0' - 40' (Elev. 2159.8t–2119.8ft)	C637005	8.52	3292	NA	NA

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 2000 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site is potentially subject to ground motions from nearby earthquake sources during the design life of the new structure. For the deterministic procedure, the controlling fault for the site is the Calico-Hidalgo fault zone (Fault ID 259). It is a right-lateral strike-slip (RLSS) fault with a maximum credible earthquake Mw=7.4, located approximately 60.0 miles southwest of the bridge site. Based on the 2009 Seismic Design Procedure, a minimum deterministic response spectrum for a vertical strike-slip fault of $M_{max} = 6.5$ at a distance of 12 km should be used in the design. The corresponding peak ground acceleration (PGA) is estimated to be 0.22g. The office of Geotechnical Design has provided Seismic Design Recommendations in a memorandum dated October 31, 2013. Please refer to that memorandum for more specific seismic recommendations.

Liquefaction/Settlement

The Seismic Design Recommendations, dated October 31, 2013, state that due to the dense nature of the underlying soils and deep groundwater, the potential for soil to liquefy at the site will be low. The amount of seismic settlement due to strong ground shaking is considered less than one inch.

Surface Rupture Potential

The site does not fall within Fault Rupture Hazard Zones in California (Alquist-Priolo Earthquake Fault Maps). The surface rupture potential at the bridge site is considered low.

Foundation Recommendations

The following recommendations are for the proposed Rojo Wash left and right bridges (Br. #54-1301 R/L), as shown on the General Plan dated November 13, 2013. Abutments 1 and 3 and Pier 2 may be supported on spread footings.

Abutment Location

Abutments 1 and 3 can be supported on spread footings in the existing embankment fill. The Spread Footing Design Data, provided by Structure Design, is presented in Tables 4 and 5 below.

Table 4 - Spread Footing Design Data

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Right Bridge	Abutment 1	WSD	2164.00	2158.00	9.00	58.75	1
	Abutment 3	WSD	2161.88	2155.00	9.00	58.75	1
Left Bridge	Abutment 1	WSD	2153.50	2148.00	9.00	58.75	1
	Abutment 3	WSD	2151.50	2144.00	9.00	58.75	1

Table 5 - Spread Footing Design Data – Service I Limit State Loads

Support Location		Total Load				Permanent Load		
		Vertical Load (kips)	Effective Dimensions (ft)		Horizontal Load in Longitudinal Direction (kips)	Vertical Load (kips)	Effective Dimensions (ft)	
			B'	L'			B'	L'
Left and Right Bridges	Abut 1 & 3	1684.0	7.76	58.75	443.0	1487.0	7.60	58.75

The recommended Permissible Gross Contact Stress, Allowable Gross Bearing Capacities and Bottom of Footing Elevations, for Abutments 1 and 3, are listed in Table 6 below.

Table 6 - Foundation Design Recommendations for Abutments 1 and 3

Support Location		Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	Total Permissible Support Settlement (in)	WSD (LRFD Service Limit State Load Combination)	
		B	L				Permissible Gross Contact Stress (ksf)	Allowable Gross Bearing Capacity (ksf)
Right Bridge	Abut 1	9.0	58.75	2158.00	5.0	1	9.5	3.9
	Abut 3	9.0	58.75	2155.00	5.0	1	10.3	3.9
Left Bridge	Abut 1	9.0	58.75	2148.00	5.0	1	9.2	3.9
	Abut 3	9.0	58.75	2144.00	5.0	1	107	3.9

In Table 6 above, the recommended Permissible Gross Contact Stress (q_{pg}) and Allowable Gross Bearing Capacity to be used for design, are based on the following design criteria:

1) The final designed spread footing will have an effective width (B') that will produce an equivalent Gross Uniform Bearing Stress (q_o), which does not exceed the Allowable Gross Bearing Capacity (q_{all}).

2) The final designed spread footing will have an effective width (B') that will produce an equivalent Gross Uniform Bearing Stress (q_o), which does not exceed the Permissible Gross Contact Stress (q_{pg}).

3) The spread footings are to be constructed at or below the recommended elevations shown in Table 6.

Contact the Office of Geotechnical Design-South 2, Branch B for re-evaluation if any of the following change:

- The footing size (B) is reduced.
- The loading conditions change.
- The bottom of footing elevation is raised.
- The minimum vertical footing embedment depths are reduced.

Pier Location

Each Pier location will consist of two (2) support columns on individual spread footings. Table 7 below, presents the Pier Spread Footing Design Data provided by Structure Design.

Table 7 - Pier Spread Footing Design Data

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Right Bridge	Pier 2 per column	LRFD	2156.76	2141.00	12.0	12.0	1
Left Bridge	Pier 2 per column	LRFD	2147.50	2130.50	12.0	12.0	1

Tables 8 and 9 below, present the LRFD Service, Strength, and Extreme Limit State Design Data provided by Structure Design.

Table 8 - LRFD Service Limit State-I Spread Footing Design Data

Support Location		Total Load			Permanent Load		
		Vertical Load (kips)	Effective Dimensions (ft)		Vertical Load (kips)	Effective Dimensions (ft)	
			B'	L'		B'	L'
Left and Right Bridges	Pier 2 per column	1063.0	11.7	12.0	849.0	12.0	12.0

Table 9 - LRFD Strength and Extreme Event Limit States

Support Location Left & Right Bridge		Strength Limit State (Controlling Group)			Extreme Event Limit State (Control Group)		
		Vertical Load (kip)	Effective Dimensions (ft)		Vertical Load (kip)	Effective Dimensions (ft)	
			B'	L'		B'	L'
Left and Right Bridges	Pier 2 per column	1851.0	11.8	12.0	1121.0	7.0	11.3

Foundation design recommendations for Pier 2, based on the spread footing design loading and approximate footing geometry provided by Structure Design, are presented below in Table 10.

Table 10 - Foundation Design Recommendations for Pier 2

Support Location		Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	Total Permissible Support Settlement (in)	Service Limit State	Strength Limit State φ = 0.45	Extreme Limit State φ = 1.0
		L	B				Permissible Net Contact Stress (ksf)	Factored Gross Nominal Bearing Resistance (ksf)	Factored Gross Nominal Bearing Resistance (ksf)
Right Bridge	Pier 2 per column	12.00	12.00	2141.00	5.0	1	10.4	17.9	47.1
Left Bridge	Pier 2 per column	12.00	12.00	2130.50	5.0	1	10.4	17.9	47.1

In Table 10 above, the recommended Permissible Net Contact Stress (q_{pn}) and Factored Gross Nominal Bearing Resistances (q_R) to be used for design, are based on the following design criteria:

1) The final designed spread footing will have an effective width (B') such that:
   - The equivalent Net Uniform Bearing Stress ($q_{n,u}$), does not exceed Permissible Net Contact Stress (q_{pn}) for Service Limit State.
   - The Gross Uniform Bearing Stress ($q_{g,u}$) does not exceed the recommended design values for the Factored Gross Nominal Bearing Resistances (q_R) for Strength and Extreme Limit States.

2) The spread footings are to be constructed at or below the recommended bottom of footing elevations shown in Table 10.

Contact the Office of Geotechnical Design-South 2, Branch B for re-evaluation if any of the following change:

- The footing size (B) is reduced.
- The loading conditions change.
- The bottom of footing elevation is raised.
- The minimum vertical footing embedment depths are reduced.

The Spread Footing Data table for Abutment and Pier supports is listed in Table 11, below.

Table 11 – Spread Footing Data Table

Support Location		Working Stress Design (WSD)		Load Resistance Factor Design (LRFD)		
		Permissible Gross Contact Stress (Settlement) (ksf)	Allowable Gross Bearing Capacity (ksf)	Service Permissible Net Contact Stress (Settlement) (ksf)	Strength Factored Gross Nominal Bearing Resistance φ = 0.45 (ksf)	Extreme Event Factored Gross Nominal Bearing Resistance φ = 1.00 (ksf)
Right Bridge	Abutment 1	9.5	3.9	N/A	N/A	N/A
	Pier 2 per column	N/A	N/A	10.4	17.9	47.1
	Abutment 3	10.3	3.9	N/A	N/A	N/A
Left Bridge	Abutment 1	9.2	3.9	N/A	N/A	N/A
	Pier 2 per column	N/A	N/A	10.4	17.9	47.1
	Abutment 3	10.7	3.9	N/A	N/A	N/A

Construction Considerations:

1) At Abutments 1 and 3 support locations, the bottom of footings are to be constructed on existing fill. Concrete for the support footings shall be placed neat against the undisturbed material at the bottom of the footing excavation. Should the bottom of the footing excavation be disturbed then the bottom of the footing excavation is to be re-compacted or replaced with structural backfill compacted to 95% relative compaction, prior to placement of steel and concrete for the structure support footings.

2) At Pier 2 support location, the bottom of the footing shall be constructed on dense native soil. Concrete for the support footings shall be placed neat against the undisturbed material at the bottom of the footing excavation. Should the bottom of the footing excavation be disturbed then the bottom of the footing excavation shall be compacted at 95% relative compaction, prior to placement of steel and concrete for the structure support footings.

3) At all support locations, the excavations are to be inspected and approved by a representative of the Office of Geotechnical Design-South 2, Branch B, prior to placing any concrete. The required inspection is to verify that the soil exposed at the bottom of the excavation complies with recommendations included in this report. Once the excavation has been completed to the specified elevations, the contractor is to allow the Office of Geotechnical Design-South 2, Branch B, seven (7) days to perform the inspection. The structures representative is to provide the Office of Geotechnical Design-South 2, Branch B, a one-week notification prior to beginning the five-day contractor waiting period.

This Foundation Report is based on specific project information regarding structure type and location that have been provided by the Office of Bridge Design South 2. Once the project plans are available, the Office of Geotechnical Design-South 2, Design Branch B should review the information to determine if this FR is still applicable. Any questions regarding the above recommendations should be directed to the attention of Fernando De Haro, (916) 227-4556 or Mark DeSalvatore, (916) 227-5391, at the Office of Geotechnical Design-South 2, Branch B.

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State of California **Business, Transportation and Housing Agency**

M e m o r a n d u m

Flex your power!
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To: MR. BARTT GUNTER
Branch Chief
Structure Design Branch 19
Office of Bridge Design South 2

Date: January 9, 2014

File: 08-SBD-40-PM 99.2
08-0N56U1
Proj. ID: 0813000176
Clipper Valley Wash Bridge (Replace)
Br. #54-1302 R/L

Attention: Mr. Charles Lomicka

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2
Design Branch B

Subject: Foundation Report for Clipper Valley Wash Bridge

In a memorandum dated March 12, 2013, Structures Design, Office of Bridge Design Branch 19 requested a Foundation Report (FR) for the proposed replacement of Clipper Valley Wash left and right bridges (Br. No. 54-1302 R/L). This FR supersedes all previously generated Preliminary Foundation Reports for this structure. The following recommendations are based on subsurface information gathered during the 2013 subsurface investigation performed at the site.

With regards to the current foundation recommendations, all elevations referenced within this report and shown on the recent Log of Test Boring sheets are based on the NGVD 1929 vertical datum.

Project Description

The Clipper Valley Wash Bridges (Br. No. 54-1302 R/L) are located in San Bernardino County on State Route 40 approximately 43 miles west of Needles, California. The proposed right and left bridge structures will consist of a seven-span, cast-in-place, prestressed concrete box-girder structure on seat type abutments.

Geology

The "Geologic Map of the San Bernardino Quadrangle, San Bernardino County, California (Revised 1998, Bortugno and Spittler)" indicates that the site is located on Quaternary Alluvium which consists of dissected and undifferentiated alluvium deposits, colluvium and fan conglomerate.

The 2013 subsurface investigation consisted of 12 mud-rotary soil borings. The soil borings revealed the site is underlain mainly by layers of dense to very dense poorly-graded and well-

graded sands with silt and silty sands, to the maximum explored depth of 57.4 feet (Elev. 1198.1 feet). For more detail, please refer to the Log of Test Borings.

Ground Water

No ground water was encountered during the 2013 subsurface investigation. Due to the Clipper Valley Wash bridges being located in an extremely arid environment, it is anticipated that surface water would only be present in the wash during brief wet periods.

Scour Potential

Structure Hydraulics and Hydrology has provided a Final Hydraulic Report in a memorandum dated October 14, 2013, which states that Clipper Valley Wash has a potential for scour. The scour data presented in the report is shown in Tables 1 and 2 below. Please refer to that memorandum for more specific information.

Table 1 - Scour Data Left Bridge (54-1302 L)

Support Location	Long Term Scour (Degradation and Contraction) (ft)	Short Term Scour (Local) Depth (ft)	Scour Elevation (ft)
Abutment 1	0	0	N/A
Pier 2	0	8.3	2049.2
Pier 3	0	8.3	2049.3
Pier 4	0	8.6	2047.1
Pier 5	0	8.8	2045.7
Pier 6	0	8.9	2043.9
Pier 7	0	8.9	2043.9
Abutment 8	0	0	N/A

Table 2 - Scour Data Right Bridge (54-1302 R)

Support Location	Long Term Scour (Degradation and Contraction) Elevation (ft)	Short Term Scour (Local) Depth (ft)	Scour Elevation (ft)
Abutment 1	0	0	N/A
Pier 2	0	8.9	2044.3
Pier 3	0	8.8	2044.1
Pier 4	0	8.8	2042.8
Pier 5	0	8.9	2042.0
Pier 6	0	8.4	2040.5
Pier 7	0	8.5	2040.7
Abutment 8	0	0	N/A

Corrosion

Corrosion test results are shown below in Table 3. The tested soil samples were taken from soil boring RC-13-002. Test results indicate the soil samples are considered non-corrosive by current Caltrans standards.

Table 3 - Corrosion Test Summary

Location	SIC Number	pH	Minimum Resistivity (Ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
RC-13-002 4.3'-5.6' (Elev. 2057.7ft–2056.4ft)	C637009	8.32	3795	NA	NA
RC-13-002 19.3'-20.6' (Elev. 2042.7ft–2041.4ft)	C637008	8.15	4060	NA	NA

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 2000 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site is potentially subject to ground motions from nearby earthquake sources during the design life of the new structure. For the deterministic procedure, the controlling fault for the site is the Calico-Hidalgo fault zone (Fault ID 259). It is a right-lateral strike-slip (RLSS) fault with a maximum credible earthquake Mw=7.4, located approximately 60.0 miles southwest of the bridge site. Based on the 2009 Seismic Design Procedure, a minimum deterministic response spectrum for a vertical strike-slip fault of $M_{max} = 6.5$ at a distance of 12 km should be used in the design. The corresponding peak ground acceleration (PGA) is estimated to be 0.22g. The office of Geotechnical Design has provided Seismic Design Recommendations in a memorandum dated October 31, 2013. Please refer to that memorandum for more specific seismic recommendations.

Liquefaction/Seismic Settlement

The Seismic Design Recommendations, dated October 31, 2013, state that due to the dense nature of the underlying soils and deep groundwater, the potential for soil to liquefy at the site will be low. The amount of seismic settlement due to strong ground shaking is considered less than one inch.

Surface Rupture Potential

The site does not fall within Fault Rupture Hazard Zones in California (Alquist-Priolo Earthquake Fault Maps). The surface rupture potential at the bridge site is considered low.

Foundation Recommendations

The following recommendations are for the proposed Clipper Valley Wash left and right bridges (Br. #54-1302 R/L), as shown on the General Plan dated December 9, 2013. Abutments and Piers may be supported on spread footings.

Abutment Location

Abutments 1 and 8 can be supported on spread footings in the existing embankment fill. The Spread Footing Design Data, provided by Structure Design, is presented in Tables 4 and 5 below.

Table 4 - Spread Footing Design Data

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Right Bridge	Abutment 1	WSD	2062.50	2057.50	9.00	80.47	1
	Abutment 8	WSD	2053.00	2048.00	9.00	80.47	1
Left Bridge	Abutment 1	WSD	2066.20	2061.00	9.00	80.47	1
	Abutment 8	WSD	2057.00	2052.00	9.00	80.47	1

Table 5 - Spread Footing Design Data – Service I Limit State Loads

Support Location		Total Load				Permanent Load		
		Vertical Load (kips)	Effective Dimensions (ft)		Horizontal Load in Longitudinal Direction (kips)	Vertical Load (kips)	Effective Dimensions (ft)	
			B'	L'			B'	L'
Left & Right Bridges	Abutment 1	1756.00	8.27	80.47	305.00	1544.00	8.69	80.47
	Abutment 8	1570.00	8.71	80.47	219.00	1358.00	8.70	80.47

The recommended Permissible Gross Contact Stress, Allowable Gross Bearing Capacities and Bottom of Footing Elevations, for Abutments 1 and 8, are listed in Table 6 below.

Table 6 - Foundation Design Recommendations for Abutments 1 and 8

Support Location		Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	Total Permissible Support Settlement (in)	WSD (LRFD Service Limit State Load Combination)	
		B	L				Permissible Gross Contact Stress (ksf)	Allowable Gross Bearing Capacity (ksf)
Right Bridge	Abut 1	9.0	80.47	2057.50	5.0	1	6.9	3.8
	Abut 8	9.0	80.47	2048.00	5.0	1	6.9	3.8
Left Bridge	Abut 1	9.0	80.47	2061.00	5.0	1	6.9	3.8
	Abut 8	9.0	80.47	2052.00	5.0	1	6.9	3.8

In Table 6 above, the recommended Permissible Gross Contact Stress (q_{pg}) and Allowable Gross Bearing Capacity to be used for design, are based on the following design criteria:

1) The final designed spread footing will have an effective width (B') that will produce an equivalent Gross Uniform Bearing Stress (q_o), which does not exceed the Allowable Gross Bearing Capacity (q_{all}).

2) The final designed spread footing will have an effective width (B') that will produce an equivalent Gross Uniform Bearing Stress (q_o), which does not exceed the Permissible Gross Contact Stress (q_{pg}).

3) The spread footings are to be constructed at or below the recommended elevations shown in Table 6.

Contact the Office of Geotechnical Design-South 2, Branch B for re-evaluation if any of the following change:

- The footing size (B) is reduced.
- The loading conditions change.
- The bottom of footing elevation is raised.
- The minimum vertical footing embedment depths are reduced.

Pier Location

Each Pier location will consist of three (3) support columns on individual spread footings. Tables 7 and 8 below, present the Pier Spread Footing Design Data provided by Structure Design.

Table 7 - Pier Spread Footing Design Data - Right Bridge

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Right Bridge	Pier 2 per column	LRFD	2054.60	2040.00	12.0	12.0	1
	Pier 3 per column	LRFD	2052.00	2039.00	12.0	12.0	1
	Pier 4 per column	LRFD	2051.10	2037.80	12.0	12.0	1
	Pier 5 per column	LRFD	2049.70	2036.00	12.0	12.0	1
	Pier 6 per column	LRFD	2048.30	2035.00	12.0	12.0	1
	Pier 7 per column	LRFD	2048.29	2034.50	12.0	12.0	1

Table 8 - Pier Spread Footing Design Data - Left Bridge

Support Location		Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
					B	L	
Left Bridge	Pier 2 per column	LRFD	2056.76	2042.00	12.0	12.0	1
	Pier 3 per column	LRFD	2057.15	2042.00	12.0	12.0	1
	Pier 4 per column	LRFD	2055.16	2042.00	12.0	12.0	1
	Pier 5 per column	LRFD	2054.03	2041.00	12.0	12.0	1
	Pier 6 per column	LRFD	2052.48	2039.50	12.0	12.0	1
	Pier 7 per column	LRFD	2051.72	2037.50	12.0	12.0	1

Tables 9 and 10 below, present the LRFD Service, Strength, and Extreme Limit State Design Data provided by Structure Design.

Table 9 - LRFD Service Limit State-I Spread Footing Design Data

Support Location		Total Load			Permanent Load		
		Vertical Load (kips)	Effective Dimensions (ft)		Vertical Load (kips)	Effective Dimensions (ft)	
			B’	L’		B’	L’
Left & Right Bridges	Pier 2 per column	793	9.7	10.3	567	11.5	11.7
	Pier 3 per column	864	11.6	11.7	638	11.9	11.9
	Pier 4 per column	864	9.8	10.6	638	11.5	11.9
	Pier 5 per column	895	10.8	11.1	669	11.9	11.9
	Pier 6 per column	892	10.4	10.8	665	11.7	11.8
	Pier 7 per column	809	10.5	11.0	584	11.7	11.8

Table 10 - LRFD Strength and Extreme Event Limit States

Support Location		Strength Limit State (Controlling Group)			Extreme Event Limit State (Control Group)		
		Vertical Load (kip)	Effective Dimensions (ft)		Vertical Load (kip)	Effective Dimensions (ft)	
			B'	L'		B'	L'
Left & Right Bridges	Pier 2 per column	1701	11.6	11.7	637	7.5	7.5
	Pier 3 per column	1833	11.9	12.0	715	7.9	7.9
	Pier 4 per column	1835	11.6	11.7	713	7.8	7.8
	Pier 5 per column	2013	11.8	11.8	732	7.8	7.8
	Pier 6 per column	1766	11.7	11.8	736	7.9	7.9
	Pier 7 per column	1802	11.8	11.8	642	7.4	7.4

Foundation design recommendations for Piers 2 to 7, based on the spread footing design loading and approximate footing geometry provided by Structure Design, are presented below in Tables 11 and 12.

Table 11 - Foundation Design Recommendations for Piers 2 to 7 - Right Bridge

Support Location	Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	Total Permissible Support Settlement (in)	Service Limit State	Strength Limit State φ = 0.45	Extreme Limit State φ = 1.0
	L	B				Permissible Net Contact Stress (ksf)	Factored Gross Nominal Bearing Resistance (ksf)	Factored Gross Nominal Bearing Resistance (ksf)
Pier 2 per column	12.00	12.00	2040.00	5.0	1	15.9	19.2	52.8
Pier 3 per column	12.00	12.00	2039.00	5.0	1	11.0	17.1	48.0
Pier 4 per column	12.00	12.00	2037.80	5.0	1	13.8	17.1	48.9
Pier 5 per column	12.00	12.00	2036.00	5.0	1	11.8	17.6	50.1
Pier 6 per column	12.00	12.00	2035.00	5.0	1	11.7	17.0	49.0
Pier 7 per column	12.00	12.00	2034.50	5.0	1	12.0	17.1	50.1

Table 12 - Foundation Design Recommendations for Piers 2 to 7 - Left Bridge

Support Location	Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	Total Permissible Support Settlement (in)	Service Limit State	Strength Limit State φ = 0.45	Extreme Limit State φ = 1.0
	L	B				Permissible Net Contact Stress (ksf)	Factored Gross Nominal Bearing Resistance (ksf)	Factored Gross Nominal Bearing Resistance (ksf)
Pier 2 per column	12.00	12.00	2042.00	5.0	1	15.9	19.2	52.8
Pier 3 per column	12.00	12.00	2042.00	5.0	1	11.0	17.1	48.0
Pier 4 per column	12.00	12.00	2042.00	5.0	1	13.8	17.1	48.9
Pier 5 per column	12.00	12.00	2041.00	5.0	1	11.8	17.6	50.1
Pier 6 per column	12.00	12.00	2039.50	5.0	1	11.7	17.0	49.0
Pier 7 per column	12.00	12.00	2037.50	5.0	1	12.0	17.1	50.1

In Tables 11 and 12 above, the recommended Permissible Net Contact Stress (q_{pn}) and Factored Gross Nominal Bearing Resistances (q_R) to be used for design, are based on the following design criteria:

1) The final designed spread footing will have an effective width (B') such that:
   - The equivalent Net Uniform Bearing Stress ($q_{n,u}$), does not exceed Permissible Net Contact Stress (q_{pn}) for Service Limit State.
   - The Gross Uniform Bearing Stress ($q_{g,u}$) does not exceed the recommended design values for the Factored Gross Nominal Bearing Resistances (q_R) for Strength and Extreme Limit States.

2) The spread footings are to be constructed at or below the recommended bottom of footing elevations shown in Tables 11 and 12.

Contact the Office of Geotechnical Design-South 2, Branch B for re-evaluation if any of the following change:

- The footing size (B) is reduced.
- The loading conditions change.
- The bottom of footing elevation is raised.
- The minimum vertical footing embedment depths are reduced.

The Spread Footing Data table for Abutment and Bent supports is listed in Table 13, below.

Table 13 – Spread Footing Data Table

Support Location Left and Right Bridges	Working Stress Design (WSD)		Load Resistance Factor Design (LRFD)		
	Permissible Gross Contact Stress (Settlement) (ksf)	Allowable Gross Bearing Capacity (ksf)	Service Permissible Net Contact Stress (Settlement) (ksf)	Strength Factored Gross Nominal Bearing Resistance φ = 0.45 (ksf)	Extreme Event Factored Gross Nominal Bearing Resistance φ = 1.00 (ksf)
Abutment 1	6.9	3.8	N/A	N/A	N/A
Pier 2 per column	N/A	N/A	15.9	19.2	52.8
Pier 3 per column	N/A	N/A	11.0	17.1	48.0
Pier 4 per column	N/A	N/A	13.8	17.1	48.9
Pier 5 per column	N/A	N/A	11.8	17.6	50.1
Pier 6 per column	N/A	N/A	11.7	17.0	49.0
Pier 7 per column	N/A	N/A	12.0	17.1	50.1
Abutment 8	6.9	3.8	N/A	N/A	N/A

Construction Considerations:

1) At Abutments 1 and 8 support locations, the bottom of footings are to be constructed on existing fill. Concrete for the support footings shall be placed neat against the undisturbed material at the bottom of the footing excavation. Should the bottom of the footing excavation be disturbed then the bottom of the footing excavation is to be re-compacted or replaced with structural backfill compacted to 95% relative compaction, prior to placement of steel and concrete for the structure support footings.

2) At Pier support locations, the bottom of the footings shall be constructed on dense native soil. Concrete for the support footings shall be placed neat against the undisturbed material at the bottom of the footing excavation. Should the bottom of the footing excavation be disturbed then the bottom of the footing excavation shall be compacted at 95% relative compaction, prior placement of steel and concrete for the structure support footings.

3) At all support locations, the excavations are to be inspected and approved by a representative of the Office of Geotechnical Design-South 2, Branch B, prior to placing any concrete. The required inspection is to verify that the soil exposed at the bottom of the excavation complies with recommendations included in this report. Once the excavation has been completed to the specified elevations, the contractor is to allow the Office of Geotechnical Design-South 2, Branch B, five (5) working days to perform the inspection. The structures representative is to provide the Office of Geotechnical Design-South 2, Branch B, a one-week notification prior to beginning the five-day contractor waiting period.

This Foundation Report is based on specific project information regarding structure type and location that have been provided by the Office of Bridge Design South 2. Once the project plans are available, the Office of Geotechnical Design-South 2, Design Branch B should review the information to determine if the recommendations in this foundation report are still applicable. Any questions regarding the above recommendations should be directed to the attention of Fernando De Haro, (916) 227-4556 or David Liao, (916) 227-5756, at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 1-9-14

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Mark DeSalvatore – OGDS-2

STRUCTURE HYDRAULICS & HYDROLOGY
REVISED
FINAL HYDRAULIC REPORT

Haller Wash Bridge (Replace)

Located approximately 47 miles west of Needles, CA on SR 40
over Haller Wash in eastern San Bernardino County

JOB:
Bridge No. 54-0891 R/L (Existing)
Bridge No. 54-1300 R/L (Proposed)

LOCATION:
08-SBd-040-PM R95.14

Project No. 0813000176

WRITTEN BY:
Diane O'Brien

DATE:
October 4, 2013

REVIEWED BY:
Jimmie Pallares

DATE:
October 4, 2013

Haller Wash
Br. No. 54-0891 R/L
08-SBd-040-PM R95.14
Project No. 0813000176

Hydrology/Hydraulics Report

General

It is proposed to replace Haller Wash Bridge (Bridge No. 54-0891 R/L) located in the Mojave Desert on State Route 40 in San Bernardino County. The two existing parallel 140-foot-long, 42-foot-wide, two-span, reinforced concrete box (RCB) girder structures were built in 1973. The existing bridges have 1.5-foot-wide pier walls and open end diaphragm abutments all on spread footings. The bridges are being replaced because of cracking indicating that the concrete quality has degraded due to many factors including Alkali-Silica Reactivity (ASR). The Item 113 code for scour vulnerability is 8 (Bridge foundations determined to be stable for the assessed or calculated scour condition).

The two new proposed single-span bridges will be on the same alignment and are 120 feet long and 43 feet wide. The new structures are PC/PS bulb-tee girders on seat abutments on spread footings. The structure depth is 6'-4 $^{1}/_{8}$".

This report is based on the General Plan No. 1 provided by Structure Design dated September 4, 2013. See References on page 7 of this report for the dates of other Sheets. **All elevations indicated in this report are based on Vertical Datum NGVD 1929.**

Basin

The Haller Wash watershed begins on the northern slope of the Clipper Mountains and flows north, spreading across a sparsely vegetated alluvial fan. Training dikes have been constructed outside of State Right of Way to divert runoff across the alluvial fan and funnel it through the bridge openings. There are two distinct deeply incised channels at the toe of the dikes that converge immediately upstream of the upstream bridge. The discharge flows between the armored banks of the channel under both bridges and then joins Clipper Valley Wash about 2,400 feet downstream.

At the bridge site, the Haller Wash watershed encompasses 1.9 square miles of undeveloped desert within the Clipper Mountain Wilderness Area in the Mojave Desert. The vegetation types are predominately creosote bush desert scrub and desert wash scrub. The Mean Annual Precipitation is about 6 inches. Elevations range from approximately 2280 feet in the channel upstream of the Right Bridge and 2275 feet in the channel upstream of the Left Bridge to over 4500 feet at the southern edge of the watershed in the Clipper Mountains.

Discharge

Haller Wash is an ungaged watershed. There is no information about a flood of record. The HEC-1 module within Watershed Modeling System (WMS) 9.1 was used to assist in the estimation of the 100-year and 50-year discharges at the bridge site. A synthetic unit hydrograph was developed using the San Bernardino County S-Graph for Desert Areas. The 6-hour (thunderstorm) and 24-hour duration 100-year precipitation was analyzed to determine which would produce the highest peak discharge. The highest peak discharge is produced from the 6-hour storm. The estimated Q100 and Q50 discharges are 2000 cfs and 1500 cfs, respectively.

Stage

HEC-RAS 4.1.0 was used to model the Q100 and Q50 discharges in the channel and through the bridge openings. The Manning's roughness coefficient used was 0.035.
The maximum water surface elevations at the Right Bridge for the Q100 and Q50 discharges are 2285.0 feet and 2284.5 feet, respectively. The maximum water surface elevations at the Left Bridge for the Q100 and Q50 discharges are 2279.7 feet and 2279.2 feet, respectively.
A minimum freeboard of 2 feet above the Q100 is recommended. This corresponds to a minimum soffit elevation for the Right Bridge of 2287.0 feet and a minimum soffit elevation for the Left Bridge of 2281.7 feet.
The Haller Wash Q100 water surface elevation (WSE) modeled with the proposed bridges was compared to the Q100 WSE for existing conditions. The proposed WSE is lower than the existing conditions WSE starting at approximately 30 feet upstream of the Right Bridge. The existing conditions WSE jumps up to a subcritical depth sooner than the proposed WSE does - resulting in the proposed WSE being 1.1 feet lower than the existing conditions WSE for a distance of less than 17 feet. After this the proposed WSE is only a little lower (< 0.2 feet) than the existing conditions WSE before they are the same again immediately downstream of the Right Bridge.
The proposed Q100 WSE is again lower than the existing conditions Q100 WSE beginning about 20 feet upstream of the Left Bridge. The existing conditions WSE jumps up to a subcritical depth sooner than the proposed WSE does - resulting in the proposed WSE being 1.2 feet lower than the existing conditions WSE for a distance of less than 14 feet. After this the proposed WSE is only a little lower (< 0.2 feet) than the existing conditions WSE before they are the same again immediately downstream of the Left Bridge.

Overtopping Flood

At extremely high discharges Haller Wash will overtop the training dikes and spread out over the upstream alluvial fan before the bridge is overtopped. Therefore it is not possible to calculate a discharge that will overtop the bridge.

Velocity

The velocities corresponding to the Q100 discharge were computed using HEC-RAS 4.1.0. The flow regime approaching the bridges is mostly supercritical. During the 100-year flood event the average velocity approaching the Right Bridge and Left Bridge is 14 fps. The peak velocity at the thalwag in the vicinity of the Right Bridge is 18 fps and in the vicinity of the Left Bridge is 17 fps.

Streambed

The streambed is composed of sand and silt with larger cobbles and boulders. This material is scourable and subject to erosion. Per a Department of Public Works-Division of Highways District 08 memo dated December 10, 1969, a grouted RSP check dam was constructed across the channel at the downstream bridge. During a field inspection in March 2013 remnants of the check dam were observed and it is almost completely buried. It can be assumed it has helped keep the channel vertically stable.

Scour

The long-term degradation of the channel invert over the life of the new structures is estimated to be one foot. There is no contraction scour. Abutments 1 and 2 are outside the channel behind the RSP. The discharge is funneled through the bridge opening by armored training dikes so the channel is expected to remain laterally stable. To account for some potential loss of the abutment fill, the abutments should be designed for two feet of general scour.

Debris

The watershed is sparsely vegetated and the proposed bridge is single span with more than 8 feet of freeboard over the 100-year water surface elevation. Therefore, debris problems are not anticipated.

Bank Protection

District should design rock slope protection (RSP) appropriate for the high velocity discharge in the channel in order to protect the abutment slopes. This may require larger sized rock than the existing RSP. The design should include flank protection at the break in the RSP (access road) between the Right and Left Bridges to prevent the flow from getting behind the rock.

Demolition

The existing piers should be removed to a minimum of 5 feet below original ground.

Haller Wash
Br. No. 54-0891 R/L
08-SBd-040-PM R95.14
Project No. 0813000176

Summary Information for the Bridge Designer

Below are summaries of key design parameters based on the hydrologic and hydraulic analyses performed for the Right and Left structures:

Right Bridge

HYDROLOGIC AND HYDRAULIC SUMMARY **RIGHT BRIDGE (Upstream)** Drainage Area: 1.9 mi^2		
Frequency	100-year	50-year
Discharge (cfs)	2000	1500
Water Surface Elevation (feet)	2285.0	2284.5
Average Velocity (fps)	14	-
Peak Velocity (fps)	18	-
Minimum Soffit Elevation (feet)	2287.0	
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 investigation.		

Long Term Scour Depths

	Degradation (feet)	Contraction Scour Depth (feet)
Abutment 1	2	0
Abutment 2	2	0

Scour Data (Elevations and Depths)

	Long Term (Degradation and Contraction) Scour Elevation (feet)	Short Term (Local) Scour Depth (feet)
Abutment 1	2289	0
Abutment 2	2289	0

ALL CALCULATED ELEVATIONS IN THIS REPORT ARE BASED ON THE VERTICAL DATUM NGVD29.

Haller Wash
Br. No. 54-0891 R/L
08-SBd-040-PM R95.14
Project No. 0813000176

Left Bridge

HYDROLOGIC AND HYDRAULIC SUMMARY **LEFT BRIDGE (Downstream)** Drainage Area: 1.9 mi^2		
Frequency	100-year	50-year
Discharge (cfs)	2000	1500
Water Surface Elevation (feet)	2279.7	2279.2
Average Velocity (fps)	14	-
Peak Velocity (fps)	17	-
Minimum Soffit Elevation (feet)	2281.7	
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 investigation.		

Long Term Scour Depths

	Degradation (feet)	Contraction Scour Depth (feet)
Abutment 1	2	0
Abutment 2	2	0

Scour Data (Elevations and Depths)

	Long Term (Degradation and Contraction) Scour Elevation (feet)	Short Term (Local) Scour Depth (feet)
Abutment 1	2282	0
Abutment 2	2282.5	0

ALL CALCULATED ELEVATIONS IN THIS REPORT ARE BASED ON THE VERTICAL DATUM NGVD29.

References

1. Haller Wash Bridge (Replace) Sheet 1and 8 dated 06/17/13, Sheet 2 and 5 dated 05/23/13, and Sheet 6 dated 06/13/13.

2. San Bernardino County Hydrology Manual, August 1986.

3. Caltrans Bridge Maintenance Records.

Haller Wash
Br. No. 54-0891 R/L
08-SBd-040-PM R95.14
Project No. 0813000176

This report has been prepared under my direction as the professional engineer in responsible charge of the work, in accordance with the provisions of the Professional Engineers Act of the State of California.

REGISTERED PROFESSIONAL ENGINEER
DIANE K. O'BRIEN
No. C48483
Exp. 6/30/14
CIVIL
STATE OF CALIFORNIA

REGISTERED CIVIL ENGINEER (SIGNATURE)

REGISTRATION NUMBER C 48483 DATE: June 30, 2014

STRUCTURE HYDRAULICS & HYDROLOGY
FINAL HYDRAULIC REPORT

Rojo Wash Bridge (Replace)

Located approximately 44 miles west of Needles, CA on SR 40
over Rojo Wash in eastern San Bernardino County

JOB:
Bridge No. 54-0894 R/L (Existing)
Bridge No. 54-1301 R/L (Proposed)

LOCATION:
08-SBd-040-PM R98.3

Project No. 0813000176

WRITTEN BY:
Diane O'Brien

DATE:
October 24, 2013

REVIEWED BY:
Ronald McGaugh

DATE:
October 24, 2013

Rojo Wash
Br. No. 54-1301 R/L
08-SBd-040-PM R98.3
Project No. 0813000176

Hydrology/Hydraulics Report

General

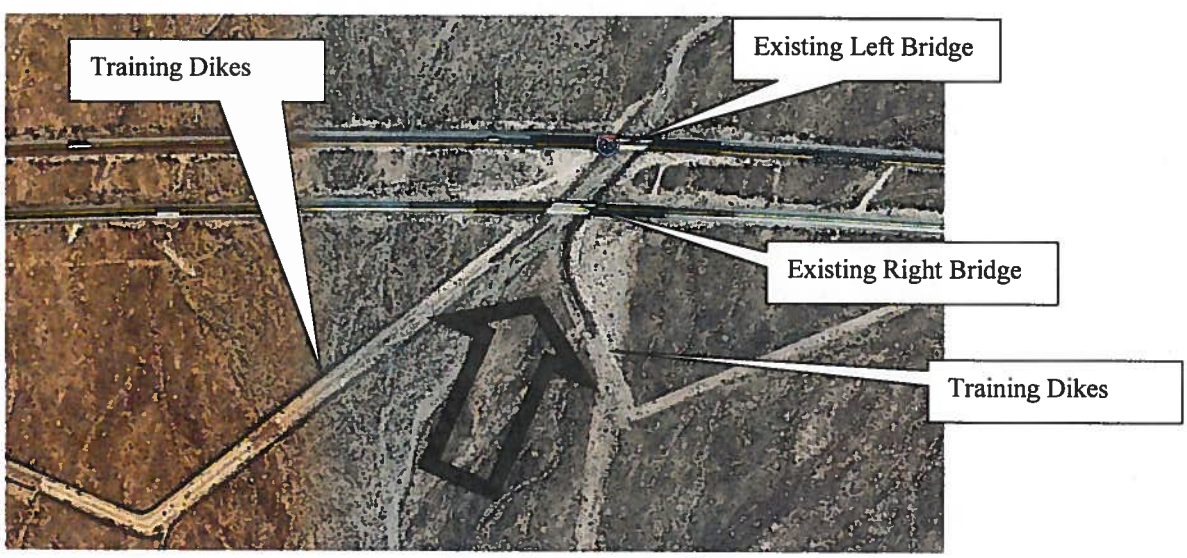
It is proposed to replace Rojo Wash Bridge (Bridge No. 54-0894 R/L) located in the Mojave Desert on State Route 40 in San Bernardino County. The two existing parallel two-span reinforced concrete box (RCB) girder structures were built in 1973. The existing bridges are 151'-5$^3/_4$" (Left) and 152'-2$^1/_2$" (Right) long, 42-feet-wide and have 1.5-foot-wide pier walls and open end diaphragm abutments all on spread footings. The bridges are being replaced because of cracking indicating that the concrete quality has degraded due to many factors including Alkali-Silica Reactivity (ASR). The Item 113 code for scour vulnerability is 8 (Bridge foundations determined to be stable for the assessed or calculated scour condition).

The two new proposed two-span bridges will be on the same alignment and are 159'-4" long and 43' wide. The new structures are PC/PS/PT box girders with a structure depth of 4'-3". The proposed two column bents are 3.5-foot-diameter on spread footings.

This report is based on the General Plan No. 1 and 2 provided by Structure Design dated 2/1/13 and the Foundation Plan dated 8/27/13. **All elevations indicated in this report are based on Vertical Datum NGVD 1929.**

Basin

The Rojo Wash watershed begins on the northern slope of the Clipper Mountains and flows north, spreading across a sparsely vegetated alluvial fan. Training dikes have been constructed outside of State Right of Way to divert runoff across the alluvial fan and funnel it through the bridge openings. There are two channels at the toe of the dikes that converge immediately upstream of the upstream bridge. The discharge flows between the armored banks of the channel under both bridges and then joins Clipper Valley Wash about 2,300 feet downstream.



At the bridge site, the Rojo Wash watershed encompasses 2.97 square miles of undeveloped desert within the Clipper Mountain Wilderness Area in the Mojave Desert. The vegetation types are predominately creosote bush desert scrub and desert wash scrub. The Mean Annual Precipitation is about 6 inches. Elevations range from approximately 2157 feet in the channel upstream of the Right Bridge and 2146 feet in the channel upstream of the Left Bridge to nearly 4600 feet at the southern edge of the watershed in the Clipper Mountains.

Discharge

Rojo Wash is an ungaged watershed. There is no information about a flood of record. The HEC-1 module within Watershed Modeling System (WMS) 9.1 was used to assist in the estimation of the 100-year and 50-year discharges at the bridge site. A synthetic unit hydrograph was developed using the San Bernardino County S-Graph for Desert Areas. The 6-hour (thunderstorm) and 24-hour duration 100-year precipitation was analyzed to determine which would produce the highest peak discharge. The highest peak discharge is produced from the 6-hour storm. The estimated Q100 and Q50 discharges are 3000 cfs and 2400 cfs, respectively.

Water Surface Elevation

HEC-RAS 4.1.0 was used to model the Q100 discharge in the channel and through the bridge openings. The Manning's roughness coefficient used was 0.035.
Due to the large bridge skew the hydraulic model was done as if each piece of the bridge foundation was a separate bridge to better represent hydraulic conditions. The water surface elevation varies along the upstream face of the bridges. Abutment 1 is upstream of Pier 2, which is upstream of Abutment 3. Separate model "runs" consisting of no structures, perpendicular structures and structures with adjusted skewed cross sections were needed for a complete analysis.

A minimum freeboard of 1 feet above the Q100 is recommended. It is not anticipated that this structure will see an overtopping flow.

Right Bridge			
	Q100 Water Surface Elevation (feet)	Q50 Water Surface Elevation (feet)	Minimum Soffit Elevation (feet)
Abutment 1	2164.0	2163.5	2165.0
Pier 2	2162.5	2162.0	2163.5
Abutment 3	2161.7	2161.2	2162.7

Left Bridge			
	Q100 Water Surface Elevation (feet)	Q50 Water Surface Elevation (feet)	Minimum Soffit Elevation (feet)
Abutment 1	2153.1	2152.8	2154.1
Pier 2	2151.6	2151.1	2152.6
Abutment 3	2150.4	2150.2	2151.4

Velocity

The velocities corresponding to the Q100 discharge were computed using HEC-RAS 4.1.0. Using the "mixed" flow regime and the 100-year flood event, the average velocity approaching the Right Bridge is 14.6 fps and approaching the Left Bridge is 15.2 fps. The velocity is very variable, with stretches of channel that temporarily shift between supercritical and subcritical flow. The peak velocity found at the thalweg at the Right Bridge is 18.1 fps and the Left Bridge is 20.3 fps.

Streambed

The streambed is composed of sand and silt with larger cobbles and boulders. This material is scourable and subject to erosion. Per a Department of Public Works-Division of Highways District 08 memo dated December 10, 1969, a grouted RSP check dam was constructed across the channel at the downstream bridge. During a field inspection in March 2013 remnants of the check dam were observed and it is almost completely buried. It can be assumed it has helped keep the channel vertically stable.

Scour

The long-term degradation of the channel invert over the life of the new structures is estimated to be 1 foot. There is no contraction scour. The discharge is funneled through the bridge openings by armored training dikes so the channel is expected to remain laterally stable. Abutments 1 and 3 are outside the channel behind the RSP. However, the Q100 water surface elevation is slightly above the top of the RSP on the east side of the channel. For this reason, and following recommendations in Hydraulic Engineering Circular No. 18 for abutments with spread footings on soil, the top of the abutment spread footings should be below the elevation of the toe of the channel banks. See Summary Tables for specific elevations.

The 3.5-foot-diameter pier columns are anticipated to be spaced about 32 feet apart center to center. This wide spacing (clear distance > 5 diameters) means that hydraulic skew (though not anticipated) would not increase the local pier scour depth.
The local scour depth for Pier 2 is estimated to be 10.5 feet for both the Right and Left Bridges. Due to the steep channel slope and the flow velocities, the thalweg elevation at the downstream side of the Right Bridge is about 2 feet lower than the upstream side. The thalweg elevation at the downstream side of the Left Bridge is about 1 foot lower than the upstream side. These lower thalweg elevations were used for scour depth/elevation computations to reflect the location of the downstream piers.

The top of the spread footings supporting the pier columns must be below the total scour elevation. This is Elevation 2144 for the Right Bridge and Elevation 2133.5 for the Left Bridge.

Debris

The watershed is sparsely vegetated and no debris accumulation was observed on the existing pier walls. Debris problems are not anticipated.
Due to the large cobbles and boulders suspended in the high velocity flow, protecting the pier columns from impact utilizing a steel plate or something similar should be considered.

Bank Protection

District should design rock slope protection (RSP) appropriate for the high velocity discharge in the channel in order to protect the abutment slopes. This may require larger sized rock than the existing RSP. The design should include flank protection at the break in the RSP (access road) between the Right and Left Bridges to prevent the flow from getting behind the rock.

Demolition

The existing piers should be completely removed.

Rojo Wash
Br. No. 54-1301 R/L
08-SBd-040-PM R98.3
Project No. 0813000176

Summary Information for the Bridge Designer

Below are summaries of key design parameters based on the hydrologic and hydraulic analyses performed for the Right and Left structures:

RIGHT BRIDGE (Upstream)

HYDROLOGIC AND HYDRAULIC SUMMARY Drainage Area: 2.97 mi^2		
Frequency	100-year	50-year
Discharge (cfs)	3000	2400
Water Surface Elevation (feet)	See Table on Page 4	
Average Velocity (fps)	14.6	-
Peak Velocity (fps)	18.1	-
Minimum Soffit Elevation (feet)	See Table on Page 4	
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 investigation.		

Long Term Scour Depths

	Degradation (feet)	Contraction Scour (feet)
Pier 2 (3.5-ft-dia. columns)	1	0

Scour Data (Elevations and Depths)

	Long Term (Degradation and Contraction) Scour Elevation (feet)	Short Term (Local) Scour Depth (feet)
Pier 2 (3.5-ft-dia. columns)	2154.5	10.5

Top of Spread Footings should be below these Elevations

Abutment 1	2160.0
Pier 2	2144.0
Abutment 3	2157.0

ALL CALCULATED ELEVATIONS IN THIS REPORT ARE BASED ON THE VERTICAL DATUM NGVD29.

Rojo Wash
Br. No. 54-1301 R/L
08-SBd-040-PM R98.3
Project No. 0813000176

LEFT BRIDGE (Downstream)

HYDROLOGIC AND HYDRAULIC SUMMARY Drainage Area: 2.97 mi^2		
Frequency	100-year	50-year
Discharge (cfs)	3000	2400
Water Surface Elevation (feet)	See Table on Page 4	
Average Velocity (fps)	15.2	-
Peak Velocity (fps)	20.3	-
Minimum Soffit Elevation (feet)	See Table on Page 4	
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 investigation.		

Long Term Scour Depths

	Degradation (feet)	Contraction Scour Depth (feet)
Pier 2 (3.5-ft-dia. columns)	1	0

Scour Data (Elevations and Depths)

	Long Term (Degradation and Contraction) Scour Elevation (feet)	Short Term (Local) Scour Depth (feet)
Pier 2 (3.5-ft-dia. columns)	2144	10.5

Top of Spread Footings should be below these Elevations

Abutment 1	2150.0
Pier 2	2133.5
Abutment 3	2146.0

ALL CALCULATED ELEVATIONS IN THIS REPORT ARE BASED ON THE VERTICAL DATUM NGVD29.

References

1. Rojo Wash Bridge (Replace) - General Plan No. 1 and 2 dated 2/1/13, Foundation Plan dated 8/27/13.

2. San Bernardino County Hydrology Manual, August 1986.

3. Improved Highway Design Methods for Desert Storms, West Consultants, Inc., August 2007.

4. Hydraulic Engineering Circular No. 18, Evaluating Scour at Bridges, Fifth Edition, April 2012.

5. Caltrans Bridge Maintenance Records.

Rojo Wash
Br. No. 54-1301 R/L
08-SBd-040-PM R98.3
Project No. 0813000176

This report has been prepared under my direction as the professional engineer in responsible charge of the work, in accordance with the provisions of the Professional Engineers Act of the State of California.

REGISTERED PROFESSIONAL ENGINEER
DIANE K. O'BRIEN
No. C48483
Exp. 6/30/14
CIVIL
STATE OF CALIFORNIA

REGISTERED CIVIL ENGINEER (SIGNATURE)

REGISTRATION NUMBER C 48483 DATE: June 30, 2014

State of California – Department of Transportation
Division of Engineering Services
Structure Design Services

Structure Hydraulics and Hydrology

FINAL HYDRAULIC REPORT

Clipper Valley Wash Bridge

Located approximately 43 miles west of Needles, CA on SR 40
over Clipper Valley Wash in eastern San Bernardino County

Bridge No. 54-0895R/L (Existing Structure)
Bridge No. 54-1302R/L (Proposed Replacement Structure)

08-SBd-040-R99.09

Project ID 0813000176

October 14, 2013

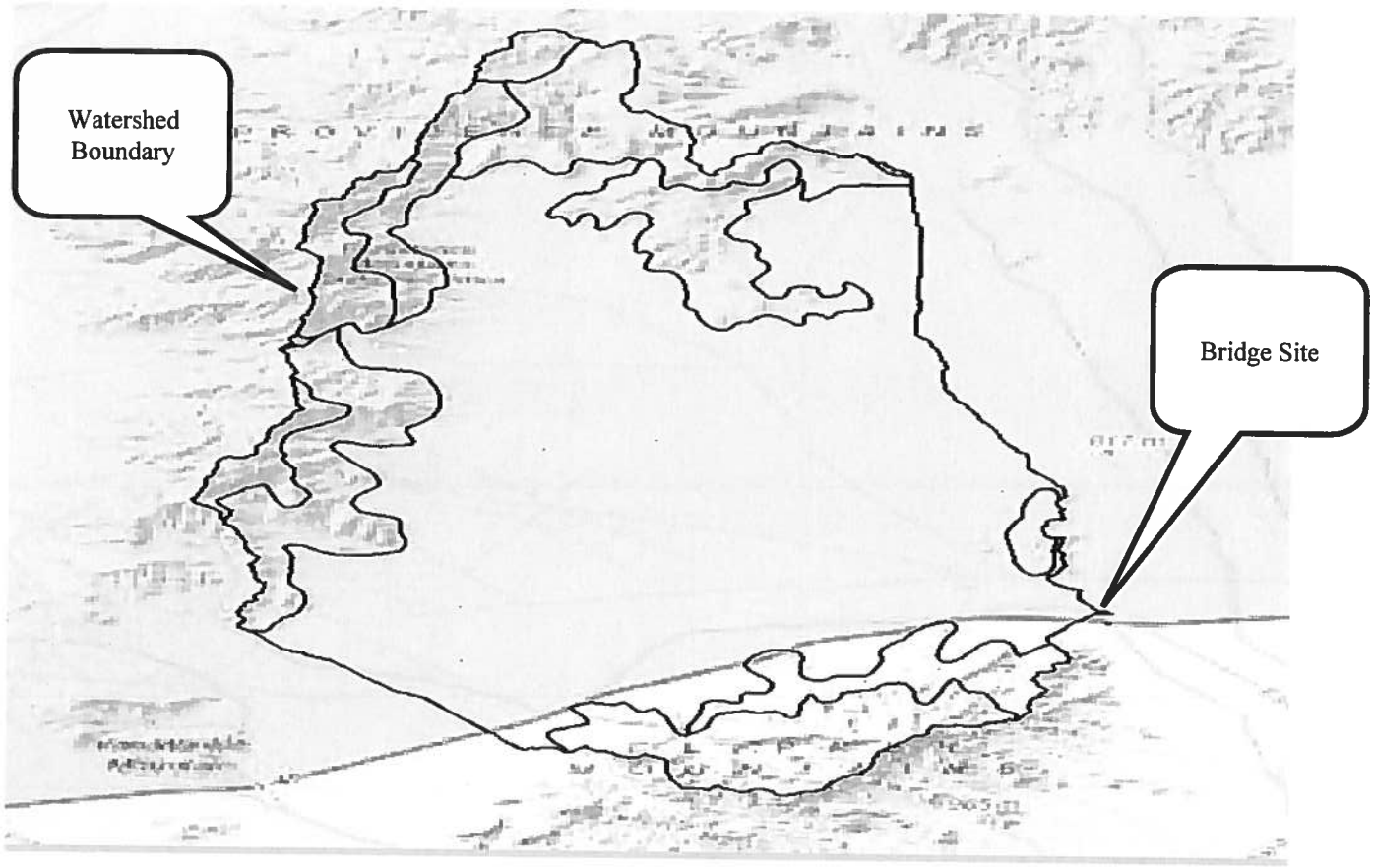
PREPARED BY:	REVIEWED BY:
Ronald McGaugh	Diane O'Brien

This report has been prepared under my direction as the professional engineer in responsible charge of the work, in accordance with the provisions of the Professional Engineers Act of the State of California

REGISTERED ENGINEER Ronald L McGaugh

REGISTRATION NUMBER C 61217

REGISTERED PROFESSIONAL ENGINEER
RONALD L McGAUGH
Lic. # C61217
Exp. 06/2015
CIVIL
STATE OF CALIFORNIA



General:

It is proposed to replace the existing Clipper Valley (Bridge No. 54-0895 R/L) located in the Mojave Desert on State Route 40 in San Bernardino County. The two existing parallel 663-foot-long, 42-foot-wide, nine-span, continuous reinforced concrete box (RCB) girder structures were built in 1973. The existing bridges have 1.5-foot-wide pier walls and open end diaphragm abutments all on spread footings. The bridges are being replaced because of cracking indicating that the concrete quality has degraded due to many factors including Alkali-Silica Reactivity (ASR). The Item 113 code for scour vulnerability is 8 (Bridge foundations determined to be stable for the assessed or calculated scour condition). The proposed replacement identical structures are a seven span continuous reinforced concrete box (RCB) girder with a total length of approximately 675 feet, width of approximately 43 feet, on 4 ft. diameter columns on spread footings. The proposed structures are on the same alignment as the existing structures.

This evaluation is based on a review of Caltrans Bridge Maintenance Records, As-Built plans, hydrologic and hydraulic reports submitted for FEMA, and APS plans submitted by Structure Design. The General Plan used for this study is dated August 23, 2013.

The data and references for this hydraulic report were obtained from the following sources:

- Caltrans' Bridge Maintenance Records.
- Preliminary Hydraulic Report for Clipper Valley Wash Bridge dated January 2010.

- Field photo documentation and bridge site submittal information received by this office dated February 2013.
- San Bernardino County Hydrology Manual, August 1986.
- Drainage Design Manual for Maricopa County Arizona
- HEC 18, Evaluating Scour at Bridges, 5th Edition.
- NOAA Atlas 14 rainfall information

All elevations indicated in this report are based on Vertical Datum NGVD 1929.

Basin:
The Clipper Valley Wash watershed is bounded by the southern slopes of the Providence Mountains north and west, and flows south easterly towards the Fenner Valley. The southern boundary of the watershed is the northern slopes of the Clipper Mountains. The bridge site is located in the Fenner Valley. Once out of the mountainous areas the flow spreads across a sparsely vegetated alluvial fan. Training dikes have been constructed outside of State Right of Way to divert runoff across the alluvial fan and funnel it through the bridge openings. At the bridge site, the Clipper Valley Wash watershed encompasses approximately 195 square miles of undeveloped desert within the Mojave Desert. The vegetation types are predominately creosote bush desert scrub and desert wash scrub. The Mean Annual Precipitation is about 5.5 inches. Elevations range from approximately 6000 feet in the mountains to approximately 2050 feet at the bridge site.

Discharge:
Since this watershed is ungaged and there is no information about a flood of record, the HEC-1 module within the Watershed Modeling System (WMS) 9.1 was used to assist in the estimation of the Q_{100} discharge at the bridge site. Synthetic unit hydrographs were developed using the San Bernardino County S-Graphs and the Drainage Manual for Maricopa County Arizona for Desert Areas. The 24-hour duration 100-year precipitation from NOAA Atlas 14 was analyzed to determine the discharge. The Q_{100} discharge used for this project is 20,700 cfs.

Streambed:
The existing channel carrying the anticipated flow to the proposed structure is relatively straight. The right bank is a levee that extends at least 500 feet upstream of the bridge site. From the General Plan and watershed flow considerations, it is anticipated that the bridge will have a hydraulic (and bridge) skew normal to the centerline of the channel of over 40 degrees. The natural channel bottom consists mostly of sand.

Modeling:
HEC-RAS 4.10 was used to model the Q_{100} discharge in the channel and through the bridge openings. The Manning's roughness coefficient used was 0.035. Modeling parameters used include:

Mixed flow regime upstream slope of 2% downstream slope of 1%

Due to the large skew and the nearly 2% profile slope of these structures the model was done as if each piece of the foundations were a separate bridge to better represent hydraulic field conditions.

Separate model "runs" consisting of no structure, the entire structure in the skewed condition, piecewise foundations with partial deck and deck only were needed for a complete analysis.

Water Surface Elevations:
Due to the large bridge skew and profile slope the following table is needed to represent the water surface elevations.

Modeled results are for: Q=20700 cfs n=0.035

Left Bridge			
	Water surface elevation (ft.)	Average velocity (ft./s)	Freeboard (ft.)
Abutment 1	2062.5	9.1	8.2
Bent 2	2061.9	9.7	7.4
Bent 3	2061.1	10.6	6.5
Bent 4	2060.7	10.2	5.1
Bent 5	2059.6	11.1	4.4
Bent 6	2059.0	11.4	3.3
Bent 7	2058.7	11.6	1.8
Abutment 8	2058.4	11.2	0.8

Right Bridge			
	Water surface elevation (ft.)	Average velocity (ft./s)	Freeboard (ft.)
Abutment 1	2058.4	11.2	9.7
Bent 2	2057.9	11.1	8.8
Bent 3	2056.9	11.0	7.9
Bent 4	2056.5	11.6	6.4
Bent 5	2055.9	11.0	5.2
Bent 6	2054.9	11.9	4.3
Bent 7	2054.3	10.3	3.0
Abutment 8	2053.6	10.6	2.3

Since this structure has nearly a 2% profile slope the section of the bridge that has less than 1 foot of freeboard is less than 4 feet along the upstream edge of the soffit near abutment 8. This is not a point of major concern for this structure. At higher discharges than 20,700 cfs the left levee will be overtopped and the flows will spread out but eventually make their way back to the Clipper Valley Wash downstream of our bridge site. It is not anticipated that this structure will see an overtopping flow.

Drift:
Historical records do not indicate a problem with drift. The watershed is sparsely vegetated and the proposed bridge has multiple spans with more than 4 feet of freeboard. Therefore, debris problems are not anticipated.

Scour:

There are no contraction scour concerns. Abutments 1 and 8 for both bridges are outside the channel behind the proposed rock slope protection (The proposed rock slope protection is provided by district forces and not covered in this report). The discharge is funneled through the bridge openings. To account for some potential loss of the abutment fill, the abutments should be designed for one foot of general scour. Local pier scour is based on 4 ft. diameter columns. The proposed bridges do not make any planned changes to the existing levees or other drainage related appurtenances.

Left Bridge			
	Existing Ground elevation at bent (ft.)	Scour depth (ft.)	Scour elevation (ft.)
Abutment 1			
Bent 2	2057.5	8.3	2049.2
Bent 3	2057.6	8.3	2049.3
Bent 4	2055.7	8.6	2047.1
Bent 5	2054.5	8.8	2045.7
Bent 6	2052.8	8.9	2043.9
Bent 7	2052.4	8.9	2043.9
Abutment 8			

Right Bridge			
	Existing Ground elevation at bent (ft.)	Scour depth (ft.)	Scour elevation (ft.)
Abutment 1			
Bent 2	2053.2	8.9	2044.3
Bent 3	2052.9	8.8	2044.1
Bent 4	2051.6	8.8	2042.8
Bent 5	2050.9	8.9	2042.0
Bent 6	2048.9	8.4	2040.5
Bent 7	2049.2	8.5	2040.7
Abutment 8			

All scour depths are measured from the existing grade at proposed column locations.

A 75 year average bridge life was assumed for the new structures. Historical cross sections show both aggradation and degradation. The degradation rate at the thalweg of the channel is .002 ft. / year. For the 75 year design life the total degradation would be 0.15 feet. For design purposes we will not use degradation.

Summary & Recommendations:

The proposed structures meet current hydraulic requirements for this crossing. A hydrologic summary of the bridge site is provided in Table 2 below.

Table 2 **HYDROLOGIC/HYDRAULIC SUMMARY for Clipper Valley Wash**	
Drainage Area: 195 mi^2	
600 foot-wide channel slope 0.01 ±ft/ft.	
Design Q_{100} Discharge (cfs)	20700
Minimum soffit Elevation Left Bridge (feet) (no freeboard for 20 ft. near abutment 8)	2058.5
Minimum soffit Elevation Right Bridge (feet)	2054.6
Average scour depth (Both bridges) (feet)	8.9
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 investigation. Addendums may be necessary as Foundation Reports are completed.**	