APPENDIX A

Memorandum of Agreement for the Treatment of Adverse Effects on Historic Properties under Section 106 of the National Historic Preservation Act

MEMORANDUM OF AGREEMENT

AMONG THE FEDERAL RAILROAD ADMINISTRATION, THE CALIFORNIA HIGH-SPEED RAIL AUTHORITY, AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER REGARDING THE MERCED-FRESNO SECTION OF THE CALIFORNIA HIGH-SPEED TRAIN SYSTEM IN MERCED, MADERA, AND FRESNO COUNTIES

WHEREAS the Federal Railroad Administration (FRA) and the California High-Speed Rail Authority (Authority) propose to construct a high-speed train (HST) system in California and have completed a Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Merced to Fresno Section of the HST Project (Undertaking); and

WHEREAS a Programmatic Agreement (PA) among FRA, the Advisory Council on Historic Preservation (ACHP), the California State Historic Preservation Officer (SHPO), and the Authority regarding compliance with Section 106 of the National Historic Preservation Act (16 United States Code [U.S.C.] § 470f) and in accordance with its implementing regulations (36 Code of Federal Regulations [CFR] Part 800), as it pertains to the California High-Speed Train Project, was executed on June 15, 2011 (**Attachment 1**); and

WHEREAS the Undertaking consists of constructing a new rail alignment, stations, maintenance facilities, electrical substations, and other appurtenant facilities between Merced and Fresno; and

WHEREAS FRA has concluded that the Undertaking will have an adverse effect on historic properties, as documented in the Findings of Effect report for the Merced to Fresno Section of the high-speed rail system; and

WHEREAS FRA and the Authority have consulted with the SHPO and the ACHP pursuant to the PA and to 36 CFR Part 800 regulations regarding the Undertaking's adverse effects on historic properties, and have notified the ACHP of the adverse effect finding pursuant to 36 CFR § 800.6(a)(1). The FRA and the Authority have invited the ACHP to participate in this Memorandum of Agreement (MOA), and in a letter dated April 23, 2012, the ACHP declined to participate.

WHEREAS FRA and the Authority have determined that the character of the proposed Undertaking's operation and maintenance constrains the Undertaking's design in a manner that precludes the possibility of avoiding adverse effects on the subject historic properties as a result of the Undertaking's implementation, and have further determined that they will resolve such effects through the execution and implementation of this MOA, as well as the Archaeological Treatment Plan (ATP; **Attachment 2**) and the Built Environment Treatment Plan (BETP; **Attachment 3**); and

WHEREAS, FRA and the Authority propose to phase identification of archaeological properties as provided for in Stipulation VI.E of the PA;

WHEREAS, in accordance with Stipulation V.A and V.B of the PA, the FRA and Authority have consulted with affected local governments and other interested parties about the Undertaking and its effects on historic properties and have taken into account all comments received from them. The City of Madera, the City of Fresno, and Fresno County have participated in the consultation and have accepted FRA's and the Authority's invitation to be consulting parties to the development of this MOA, the ATP, and the BETP; and

WHEREAS in accordance with Stipulation IV.A.5 and IV.C.2 of the PA, FRA has formally consulted with or has made a good faith effort to formally consult with the following federally recognized Native American tribes with ancestral ties to Madera, Merced, or Fresno counties and has invited them to participate as consulting parties in the development of this MOA and the ATP: Big Sandy Rancheria of Mono Indians, Cold Springs Rancheria of Mono Indians, Santa Rosa Rancheria Tachi Tribe, the North Fork

Rancheria of Mono Indians, the California Valley Miwok Tribe, the Table Mountain Rancheria, and the Picayune Rancheria of Chuckchansi; and

WHEREAS the California Valley Miwok Tribe, the Cold Springs Rancheria of Mono Indians, the North Fork Rancheria of Mono Indians, and the Santa Rosa Rancheria Tachi Tribe have accepted FRA's invitation to be consulting parties to the development of this MOA and the ATP; and

WHEREAS in accordance with Stipulation IV.B.5, IV.C.1, and IV.C.2 of the PA, the Authority has consulted with or made a good faith effort to consult with the following non-federally recognized Native American tribes with ancestral ties to Madera, Merced, or Fresno counties and has invited them to participate as consulting parties in the development of this MOA and the ATP: Kings River Choinumni Farm Tribe, Dunlap Band of Mono, Choinumni Tribe of Yokuts, the Choinumne Tribe, the Traditional Choinumni Tribe, the North Fork Mono Tribe, the Sierra Nevada Native American Coalition, the Southern Sierra Miwuk Nation, the North Valley Yokuts Tribe, and the Chowchilla Tribe of Yokuts; and

WHEREAS the North Fork Mono Tribe and the Chowchilla Tribe of Yokuts have accepted the Authority's invitation to be consulting parties to the development of this MOA and the ATP; and

WHEREAS a list of abbreviations and acronyms, of which shall apply to this MOA, is included in **Attachment 5**;

NOW, THEREFORE FRA, the Authority, and SHPO agree the Undertaking will be implemented in accordance with the following stipulations in order to resolve the effects of the Undertaking on historic properties, and further agree that these stipulations shall govern the Undertaking and all its parts until this MOA expires or is terminated.

STIPULATIONS

The FRA shall ensure that the following stipulations of this MOA are carried out as follows:

I. MODIFICATIONS TO THE AREA OF POTENTIAL EFFECTS

The Area of Potential Effects (APE) for the Undertaking consists of both a Built Environment and Archaeological APE and is described and depicted in **Attachment 4** (Figures 1 to 3) of this MOA. The APE consists of approximately 60 linear miles of track on new alignment, with a right-of-way anticipated to average about 100 feet. The APE represents the maximum extent of any potential direct ground disturbance and of any indirect effects from the construction of the Undertaking. The APE was developed and agreed upon among FRA, the Authority, and the SHPO, and accounts for potential impacts on both archaeological and built-environment resources that may result from the construction and operation of the Undertaking.

If modifications to the Undertaking, subsequent to the execution of this MOA, necessitate the revision of the APE, FRA and the Authority shall submit the revised proposed APE to SHPO. SHPO will have 15 days to review and concur on the APE. If SHPO does not concur, FRA and the Authority will revise the APE based upon SHPO comment and resubmit for concurrence. SHPO will have 15 days to review and concur on this revised APE. Actions to be taken after any such modification shall be conducted in accordance with Stipulations VI.A and IX of the PA.

II. COMPLETION OF HISTORIC PROPERTIES IDENTIFICATION EFFORT FOR THE ARCHAEOLOGICAL APE PRIOR TO CONSTRUCTION

FRA and the Authority acknowledge that approximately 80% of the land in the Undertaking's APE has yet to be surveyed for archaeological resources at the time of the execution of this MOA, due to a lack of legal access to that land. As provided for in Stipulation VI.E of the PA, this MOA addresses the development and implementation of a post-review identification and evaluation effort for the Undertaking. Completion of the historic properties identification effort will be consistent with Stipulation VI of the PA. FRA and the Authority shall provide the SHPO with the information necessary to document that efforts to identify and evaluate historic properties in the Undertaking's APE are sufficient to comply with 36 CFR § 800.4(b) and (c).

The completion of the phased historic properties identification effort may occur incrementally throughout the APE and will entail pedestrian archaeological survey of the as-yet unsurveyed portions of the APE and testing and evaluation of archaeological sites within the APE that cannot be avoided. For any archaeological site (except those identified as exempt from evaluation, per Attachment D of the PA) identified as a result of the post-review archaeological identification effort, the FRA and the Authority shall provide the SHPO with the information necessary to document that efforts to evaluate resources in the Undertaking's APE are sufficient to comply with 36 CFR § 800.4(c). The ATP describes the methods that will be employed to conduct archaeological site evaluations and specifies where and under what circumstances further efforts to identify significant archaeological deposits will take place within the areas of direct impact.

If testing is not combined with data recovery, the results of testing and evaluation work will be documented in an Archaeological Evaluation Report or Reports (AER). The results of the investigation will provide the basis for National Register of Historic Places (NRHP) and California Register of Historic Places (CRHR) eligibility recommendations. After review and concurrence of the findings by the Authority and FRA, the AER will be submitted to the SHPO and consulting parties for a concurrent 15-day review and comment period. If no objection is made within the 15-day review period, the AER will become final. Any disputes will be addressed under Stipulation V.C of this MOA.

As allowed under Stipulation VI.C of the PA, this MOA includes provisions for treatment plans that include use of a combined archaeological testing and data recovery program. When this approach is implemented, within 14 days of completion of the testing field work within a designated portion of the APE, the Principal Investigator will prepare a Field Summary Letter Report that describes the testing efforts and results within the designated area. The report will include recommendations regarding site eligibility based on the site integrity and the ability to address relevant research questions. With approval from the Authority and FRA, the letter will be submitted to SHPO with a request for concurrence within 15 days. If there is a disagreement, SHPO may conduct a field visit. If a disagreement remains after a field visit, then under Stipulation VI.D of the PA, FRA may forward a Determination of Eligibility documentation to the Secretary of the Interior for resolution in accordance with 36 CFR 800.4(c)(2). Upon SHPO concurrence, treatment will move into the data recovery phase for those resources identified as eligible properties. Where testing and data recovery are combined within a designated portion of the APE, the results of the treatment will be documented in a combined testing and data recovery report for the designated area. After completion of the analysis, a report will be submitted to SHPO and consulting parties for a concurrent 15-day review. If no objection is made within the 15-day review period, the report will become final. Any disputes will be addressed under Stipulation V.C of this MOA.

III. TREATMENT OF HISTORIC PROPERTIES IDENTIFIED IN THE APE

This MOA outlines FRA's and the Authority's commitments regarding the treatment of all historic properties, both currently known and yet-to-be-identified, that will be affected by the Undertaking. Two detailed historic property treatment plans have been prepared for the Undertaking. The **ATP**, **Attachment 2**, describes treatments for effects on archaeological properties and Native American traditional cultural properties. The **BETP**, **Attachment 3**, describes the treatments for effects on the built environment resources. The work described in the treatment plans will be conducted prior to construction, during construction, and/or after construction of the Undertaking. The treatments to historic properties known at the time of execution of this MOA are summarized in an impact/treatment table, organized by historic property, in **Attachment 6**. The treatment measures listed will be applied to historic properties affected in order to avoid, minimize, and/or mitigate impacts of the Undertaking. The Authority shall implement and complete the treatment measures within 2 years of completion of construction of the Undertaking, or earlier if so specified.

The Authority shall ensure that sufficient time and funding are provided to complete all necessary preconstruction commitments before disturbances related to the Undertaking occur. The contractor will consult with the Authority on each portion of the Undertaking to ensure that ground-disturbing activities are approved to proceed before any such activities occur.

A. Archaeological Treatment Plan

The ATP describes in detail the methods that will be employed to complete the historic properties identification effort within the Undertaking's APE as part of the phased identification of archaeological resources. More specifically, the ATP builds upon the identification efforts completed to date and specifies where and under what circumstances further efforts to identify significant archaeological deposits will take place within the Undertaking's areas of direct impact. The ATP also describes in detail the avoidance, minimization, and/or mitigation treatment measures for all currently known and yet-to-be-identified significant archaeological resources and Native American cultural resources affected by the Undertaking. FRA and the Authority commit to implementing the terms of the ATP. The major elements and commitments in the ATP include the following:

- **Project Personnel Roles and Responsibilities**
- **Archaeological survey/identification**
- **Archaeological evaluations/eligibility determinations**
- **Findings of effect determinations**
- **Establishment of environmentally sensitive areas (ESAs), where feasible**
- **Intentional site capping for preservation in place of significant archaeological sites, where feasible**
- **Data recovery excavations**
- **Procedures and protocols for archaeological monitoring during construction**
- **Procedures and protocols for unanticipated discoveries during construction**
- **Protocols for the treatment of human remains of Native American origin**
- **Responsibilities for consultation and coordination with Indian tribes**
- **Native American Graves Protection and Repatriation Act (NAGPRA) compliance (where applicable)**
- **Ownership and curation of archaeological materials**

As described in the Project Roles and Responsibilities section of the ATP, the cultural resources Principal Investigator (PI) is responsible for the preparation of all technical reports/deliverables necessary to satisfy the commitments of the ATP and for the submittal of those reports and deliverables to the Authority and FRA for review and approval. Upon review and approval by the Authority and FRA, the Authority is responsible for submitting the documentation to the SHPO and the consulting parties to this MOA. The SHPO and the consulting parties to this MOA shall have the opportunity to review and comment on all cultural resources documentation prepared under the terms of the ATP within 15 days, unless otherwise stated in the ATP. The documents and deliverables associated with the commitments detailed in the ATP are listed in Section 14.0 of the ATP. If the SHPO does not comment with 15 days, then the documentation will be considered final and work will proceed. Electronic submittals of draft documents for review and comment are acceptable.

B. Built Environment Treatment Plan

The BETP provides detailed descriptions of treatment measures for built environment historic properties located within the APE that will be affected by the Undertaking and are listed in **Attachment 6**. The treatments will be carried out by qualified professionals (see Section V.A, below). The treatment measures are included in the BETP and are intended to avoid, minimize, and/or mitigate adverse effects caused by the Undertaking. FRA and the Authority commit to implementing the terms of the BETP. The major elements and commitments in the BETP include the following:

- **Roles and Responsibilities**
- **Reporting, Monitoring, and Scheduling Procedures**
- **Pre- and Post-Construction Conditions Assessments**
- **Protection and Stabilization Plans**
- **Response Plan for Unanticipated Effects and Inadvertent Damage**
- **Historic American Landscape Survey /Historic American Engineering Record (HALS/HAER) Documentation Procedures**
- **Avoidance of Vibration Effects**
- **Avoidance and Mitigation of Noise Effects**
- **Historic Preservation Design Review**
- **Salvage of Architectural Details**
- **Preparation of Interpretive Materials and Exhibits**

As described in the Roles and Responsibilities section of the BETP, the Architectural History Principal Investigator is responsible for the preparation of all reports/deliverables necessary to satisfy the commitments of the BETP and for the submittal of those reports and deliverables to the Authority and FRA for review. Upon review and concurrence by the Authority and FRA, the Authority is responsible for submitting the documentation to the SHPO and consulting parties for review and comment. The SHPO and consulting parties to this MOA shall have 15 days to review and comment on all cultural resources documentation prepared under the terms of the attached BETP, unless otherwise stated in the BETP. If the SHPO does not comment within 15 days, then the documentation will be considered final and work will proceed. Electronic submittals of draft documents for review and comment are acceptable.

IV. Unanticipated Discoveries During Construction

As described in the ATP, it is possible that previously unknown archaeological resources could be discovered during ground-disturbing construction activities associated with the Undertaking. The following protocols, which are also presented in the ATP, will be implemented in the event of such discoveries.

A. Protocols for Discoveries

If any potential archaeological resources are observed or suspected during construction, the onsite archaeological monitor will issue a temporary work stoppage to the equipment operator to allow for a closer inspection of the discovery. Work will be stopped within 50 feet of the discovery, or other such distance that is determined by the archaeological monitor to be necessary to avoid or minimize harm to the discovered archaeological resources. Construction activities may continue outside the area of the discovery, but the area of the discovery will remain undisturbed by construction activities until the archaeological monitor can complete an inspection. If the archaeological monitor determines that further investigation may be necessary, the archaeological monitor will notify and consult with the PI regarding the discovery. In accordance with Stipulation XI.B of the PA, if the PI determines that adverse effects on the resource can be avoided, no consultation with MOA signatories and consulting parties is necessary. If the PI determines that the archaeological discovery appears NRHP-eligible and adverse effects cannot be avoided, the PI will issue a stop work order and will notify the Authority Representative (AR) of the discovery.

B. MOA Signatory Consultation

In accordance with Stipulation XI.B of the PA, the Authority will consult with the FRA within 24 hours of a discovery for which a stop work order has been issued to determine whether the unanticipated discovery is an eligible or potentially eligible property that will be adversely affected by the Undertaking. If the Authority and FRA determine that the property is likely an eligible or potentially eligible property that would be adversely affected by the Undertaking, they will develop recommendations regarding the proposed treatment measures to minimize adverse effects on the discovered resource. Within 48 hours of the discovery, the Authority will notify the SHPO of the discovery by phone or email. The Authority, in consultation with the FRA, will provide the SHPO with the recommended approach to treating the discovery. Consultation with the SHPO on the discovery will be conducted via email and phone, with hard copy documentation on the treatment to follow. If the Authority and FRA determine, in consultation with the SHPO, that the unanticipated discovery is not eligible and no further investigation is warranted, the AR will notify the resident engineer that clearance has been granted to resume work in the area.

C. Consultation with Native American Tribes

In accordance with Stipulation XI.C of the PA, the Authority shall notify the FRA and then the Authority shall notify local affiliated Native American tribes (see recitals above) of any discoveries that have the potential to adversely affect properties of religious or cultural significance to them within 24 hours of the discovery. After reviewing such discoveries, the aforementioned Native American tribes can request further consultation on the Undertaking by notifying the FRA in writing within 48 hours of FRA providing notice of the discovery. For interested Native American groups that are not federally recognized, the Authority shall notify them of any discoveries that have the potential to adversely affect properties of religious or cultural significance to them within 24 hours of the discovery. After reviewing such discoveries, the interested Native American groups can request further consultation on the Undertaking by notifying the Authority in writing within 48 hours of the Authority providing notice of the discovery.

D. Evaluation and Treatment of Unanticipated Discoveries

Upon agreement between the signatories to this MOA regarding the appropriate treatment for an unanticipated discovery, the Authority will direct that data recovery be conducted in accordance with an Unanticipated Discovery Memorandum, as described in the ATP. As soon as the data recovery fieldwork is completed, work in the area of the discovery can resume. An Archaeological Data Recovery Report will be prepared subsequently in accordance with the ATP.

V. ADMINISTRATIVE STIPULATIONS

A. Professional Standards and Report Dissemination

All activities regarding history, collections management, historical archaeology and prehistoric archaeology, architecture, landscape architecture, and architectural history that are accomplished pursuant to this MOA will be carried out by or under the direct supervision of persons meeting the "Secretary of the Interior's Professional Qualification Standards" (36 CFR Part 61).
The Authority and FRA will ensure that any additional professionals required to implement any of the provisions in this MOA, the ATP, and/or the BETP will be appropriately qualified to undertake such tasks.

The Authority and FRA shall ensure that all reports resulting from implementation of the ATP and the BETP meet contemporary professional standards as specified in "The Secretary of the Interiors Standards for the Treatment of Historic Properties" (National Park Service 1995 and updates); the "Secretary of the Interior's Standards and Guidelines for Archaeological Documentation" (National Park Service 1983 and updates); and "The Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation" (*Federal Register* 2003) as well as applicable standards and guidelines outlined in the California Office of Historic Preservation's *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format* (OHP 1990) and California Office of Historic Preservation's *Guidelines For Archaeological Research Designs* (OHP 1991). Copies of all final reports will be provided to the SHPO, the Central California Information Center and the consulting parties.

FRA and the Authority shall ensure that the materials and records resulting from the activities prescribed by this MOA are curated in accordance with 36 CFR Part 79 to the extent feasible.

B. Confidentiality

The signatories to this MOA acknowledge that the handling of documentation regarding historic properties covered by this MOA are subject to the provisions of § 304 of the National Historic Preservation Act of 1966, where federal land is involved and § 6254.10 of the California Government Code (Public Records Act), relating to the disclosure of archeological site information, where non-federal land is involved. Having so acknowledged, the signatories will ensure that all actions and documentation prescribed by this MOA are consistent with said sections, as applicable. Stipulation XII of the PA regarding confidentiality remains in effect and also applies to actions and documentation prescribed by the MOA.

C. Dispute Resolution

Should any signatory to this MOA object at any time to any actions proposed or the manner in which the terms of this MOA are implemented, FRA shall consult with such party to resolve the objection. If FRA determines that such objection cannot be resolved within fifteen (15) calendar days, FRA shall forward all documentation relevant to the dispute, including the FRA's proposed resolution, to the ACHP. FRA will also provide a copy to all signatories and concurring parties. The ACHP shall provide FRA with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, FRA shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. FRA will then proceed according to its final decision.

If the ACHP does not provide its advice regarding the dispute within the thirty-day (30-day) time period, FRA may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, FRA shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the MOA, and provide them and the ACHP with a copy of such written response.

FRA's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remains unchanged.

D. Amendment

Any signatory party to this MOA may propose that this MOA be amended, whereupon all signatory parties shall consult for no more than 15 days to consider such an amendment. The amendment will be effective on the last date a copy of it is signed by all of the signatories in counterpart. If the signatories cannot agree to appropriate terms to amend the MOA, any signatory may terminate the MOA in accordance with Stipulation V.E, below.

To address changes in the Undertaking or the treatment of historic properties affected by the Undertaking, the Authority may propose revisions to one or both historic property treatment plans to the other parties to this MOA. Upon the written concurrence of the SHPO, the Authority in coordination with FRA may revise the plan(s) to incorporate the agreed-upon changes without executing a formal amendment to this MOA.

E. Termination

If any signatory believes that the terms of this MOA are not being carried out or cannot be carried out, that party shall immediately consult with the other parties for a period of at least 30 days to attempt to develop an amendment per Stipulation V.D above. Should such consultation result in an agreement on an alternative to termination, the signatory parties shall proceed in accordance with the terms of that agreement.

If within thirty (30) days, or another time period agreed to by all signatories, an agreement for the amendment to the MOA cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories. Termination hereunder shall render this MOA without further force or effect.

If this MOA is terminated for any reason, and FRA determines that the Undertaking will proceed, FRA will either execute a new MOA with the signatories under 36 CFR § 800.6(c)(1), or request, take into account, and respond to, the comments of the ACHP pursuant to 36 CFR § 800.7. FRA shall notify the signatories as to the course of action it will pursue.

F. Resolution of Public Objections

At any time during implementation of the measures stipulated in this MOA, should a member of the public raise an objection in writing pertaining to such implementation to any signatory party to this MOA, that signatory party shall immediately notify the other signatory parties in writing of the objection. FRA shall consult with the objecting party and with the other signatories for no more than thirty (30) days. FRA will take all comments from the other signatory parties into account. Within fifteen (15) days following closure of the consultation period, FRA shall render a decision regarding the objection and notify all parties of this decision in writing, including a copy of the response to the objecting party. FRA's decision regarding resolution of the objection will be final. Following issuance of its final decision, FRA may authorize the action subject to the objection to proceed in accordance with the terms of that decision.

G. Notice to Proceed

Upon completion of reviews without objection, or with resolution of objections under Stipulation V.C or V.F of this MOA, the Authority will issue a notice to proceed in areas where adverse effects on historic properties have been addressed through this MOA and supporting documentation.

H. Duration

If FRA determines that construction of the Undertaking has not been initiated within ten (10) years following execution of this MOA, the signatories shall consult to reconsider its terms. Reconsideration may include continuation of the MOA as originally executed, amendment, or termination.

This MOA will be in effect through the Authority's implementation of the Undertaking and will terminate and have no further force or effect when FRA, in consultation with the other signatories, determines that the terms of this MOA have been fulfilled in a satisfactory manner. FRA shall provide the other signatories with written notice of its determination and of termination of this MOA

I. Reporting

Electronic submittals are acceptable to expedite reviews.

1. Annual Report

An annual report (Report) shall be prepared by the Authority, in consultation with FRA, documenting the implementation of this MOA. The reporting period shall begin on the date the Notice to Proceed is given to the contractor, and shall end for that reporting year 365 days after that date. Annual reporting will be required so long as this MOA is in effect.

The Report shall include, at a minimum:

- List of all studies, reports, actions, evaluations, or monitoring reviewed or generated under the Stipulations of this MOA.
- Record of all consultation and outreach efforts related to the implementation of this MOA.
- Record of all efforts to identify and/or evaluate potential historic properties, monitoring efforts, archaeological management assessments or research designs, and treatment of historic properties.

- Any recommendations to amend this MOA or improve communications among the parties.

The Authority shall submit the Report to FRA, and after review by FRA, the report will be provided to the SHPO, the signatories and the consulting parties, and the Authority shall ensure that the Report is made available to the public, upon request. At the request of the SHPO or the signatories and consulting parties, the Authority, in consultation with FRA, shall supplement this process through meeting(s) to address comments and/or questions.

The Authority shall submit an annual report to the FRA, the SHPO, and the ACHP no later than three (3) months following the end of the State fiscal year until all treatment is completed. There will be a thirty-day (30-day) period to review and comment on the report. The Annual Report will be finalized after the close of the thirty-day (30-day) comment period.

The Authority shall provide that the report herein prescribed is available for public inspection. The report will be sent to signatories and consulting parties of this Agreement, including Native American tribes, and a copy made available to members of the public for comment, upon request.

2. Monthly Progress Reports

Monthly progress reports documenting the implementation of the ATP and BETP will be prepared by the implementing contractor and submitted to the cultural resources point of contact at the Authority and FRA. Upon request, the monthly report will be provided to the SHPO and consulting parties to this MOA. The progress report may be submitted in digital form and will at a minimum include the following:

- Name of project segment.
- Reference to the specific treatment(s) and historic properties being treated.
- Date, person, professional area of qualification, and entity/firm preparing and submitting the report.
- Activities conducted since the previous progress report, including the status of any field work, analysis, or document preparation. Report of inadvertent discoveries or effects, and the result of any response activities implemented.
- Activities planned for the upcoming month.
- Known issues affecting the implementation of the ATP, BETP, or project schedule.
- Potential issues that could affect the implementation of the ATP, BETP, or project schedule.

VI. EFFECTIVE DATE AND EXECUTION

This MOA will take effect on the date that it has been executed by the Authority, FRA, and the SHPO.

Execution of this MOA by FRA and the Authority, its filing with the ACHP in accordance with 36 CFR 800.6(b)(1)(i), and subsequent implementation of its terms, shall evidence, pursuant to 36 CFR 800.6(c), that this MOA is an agreement with the ACHP for purposes of Section 106 of the National Historic Preservation Act (NHPA), and shall further evidence that FRA and the Authority has afforded the ACHP an opportunity to comment on the Undertaking and its effects on historic properties, and that FRA and the Authority has taken into account the effects of the Undertaking on historic properties.

SIGNATORIES

FEDERAL RAILROAD ADMINISTRATION

By: Corey Hill Date: 8/28/12

Name: Corey Hill

Title: Director, Rail Project Development and Delivery

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

By: Jeff Morales Date: 8-30-12

Name: Jeff Morales

Title: Chief Executive Officer

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: ______________________ Date: 8/31/12

for Name: Milford Wayne Donaldson, FAIA

Title: California State Historic Preservation Officer

CONCURRING PARTIES

CALIFORNIA VALLEY MIWOK TRIBE

By: ______________________________ Date: ________________

Name:

Title:

COLD SPRINGS RANCHERIA OF MONO INDIANS

By: ______________________________ Date: ________________

Name:

Title:

NORTH FORK RANCHERIA OF MONO INDIANS

By: ______________________________ Date: ________________

Name:

Title:

SANTA ROSA RANCHERIA TACHI TRIBE

By: ______________________________ Date: ________________

Name:

Title:

NORTH FORK MONO TRIBE

By: ______________________________ Date: ________________

Name:

Title:

CHOWCHILLA TRIBE OF YOKUTS

By: ______________________________ Date: ________________

Name:

Title:

CITY OF MADERA

By: ______________________________ Date: ________________

Name:

Title:

CITY OF FRESNO

By: ______________________________ Date: ________________

Name:

Title:

COUNTY OF FRESNO

By: ______________________________ Date: ________________

Name:

Title:

APPENDIX B

Biological Opinion (USFWS and NMFS)

U.S. Fish and Wildlife Service

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
08ESMF00-2012-F-0248

SEP 14 2012

David Valenstein
Chief, Environmental and Systems Planning Division
U.S. Department of Transportation
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Subject: Biological Opinion on the California High-Speed Train System: Merced to Fresno Section Project, Merced, Madera, and Fresno Counties

Dear Mr. Valenstein:

This is in response to the Department of Transportation, Federal Railroad Administration (FRA), November 28, 2011, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the California High-Speed Train System: Merced to Fresno Section (CHST-MF) Project, located in Merced, Madera, and Fresno Counties, California. Your request was received in our office on December 1, 2011. This document represents the Service's biological opinion on the effects of the action on the endangered San Joaquin kit fox (*Vulpes macrotis mutica*), the threatened central California Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*) (central California tiger salamander), the endangered conservancy fairy shrimp (*Branchinecta conservation*), the threatened vernal pool fairy shrimp (*Branchinecta lynchi*) and its designated critical habitat, the endangered vernal pool tadpole shrimp (*Lepidurus packardi*) and its designated critical habitat, the threatened Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), the threatened Colusa grass (*Neostapfia colusana*), the threatened San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*), the endangered hairy Orcutt grass (*Orcuttia pilosa*), the endangered Greene's tuctoria (*Tuctoria greenei*), the threatened succulent owl's-clover (*Castilleja campestris* ssp. *succulenta*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq) (Act). Critical habitat for the central California tiger salamander, the conservancy fairy shrimp, the Valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, and the succulent owl's-clover has been designated but does not occur within the proposed CHST-MF project action area. Critical habitat has not been designated for the San Joaquin kit fox. The Service has determined that the CHST-MF Project, as proposed, is not likely to adversely affect the critical habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp.

Although the FRA initiated formal section 7 consultation on the entire CHST-MF segment, FRA and the California High Speed Rail Authority (Authority) have subsequently clarified that at this point in time, they are planning to implement the Project in phases, with Phase 1 being a specific portion of the CHST-MF alignment. This portion includes the Fresno station of the segment, and runs northwest to Avenue 17, just to the north and east of Madera as depicted in Figure 1, below. Therefore, this document presents the Service's Biological Opinion (BO) on the effects of the entire Project on the species and critical habitat identified above, based upon conservative assumptions about the magnitude and nature of the impacts resulting from construction and operation of the Project; however, the Incidental Take Statement included herein is only for the specific portion of the Project identified as Phase 1.

This biological opinion is based on: (1) *Draft Merced to Fresno Section Project EIR/EIS, Volume I Report*, dated August 2011; (2) *Draft Merced to Fresno Section Project EIR/EIS, Volume II: Technical Appendices*, dated August 2011; (3) *Draft Biological Resources and Wetlands Technical Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011; (4) *Draft Wetlands Delineation Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011; (5) *Draft Special Status Plant Survey Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011; (6) *Draft Biological Assessment, Merced to Fresno Section Project EIR/EIS*, dated November 2011; (7) *Draft Biological Assessment Appendix B-Suitable Habitat for Branchiopods and Central California tiger salamander, Appendix C-Suitable Habitat for Valley Longhorn Elderberry Beetle, Merced to Fresno Section Project EIR/EIS*, dated October 2011; (8) *Draft Biological Assessment, Merced to Fresno Section*, dated November 2011; (9) *Supplemental Information on the Preferred Hybrid Alternative for the Merced to Fresno Section of the California High-Speed Train*, dated February 21, 2012; (10) *Memorandum: Response to Request for Supplemental Information for the Merced to Fresno (MF) Section of the California High-Speed Train Project*, dated February 29, 2012; (11) *Merced to Fresno Section Draft Landscape Permeability Plan* (LPP), dated March 2012; (12) *Draft Merced to Fresno Section Mitigation Strategy and Implementation Plan* (MSIP), dated March 2012 and updated July 2012; (13) site visit conducted on March 20, 2012; (14) *Project Description, Hybrid Alternative, Merced to Fresno Section*, dated April 2012; (15) *Memorandum: Dedicated Wildlife Crossings for the Merced to Fresno Section of the California High-Speed Train System*, dated April 13, 2012; (16) *USFWS Conservation Measures Matrix*, received on April 16, 2012; (17) Additional Information Regarding the Cumulative Effects of Implementing the Merced to Fresno High-Speed Train Project, received on April 16, 2012; (19) *Final California High-Speed Train Final Merced to Fresno Section Project EIR/EIS*, dated April 2012; and (20) other information available to the Service other information available to the Service, including the *Preliminary Alternatives Analysis Report, Merced to Fresno Section High-speed Train Project EIR/EIS,* dated April 2010; the *Supplemental Alternatives Analysis Report, Merced to Fresno Section High-speed Train Project*, dated August 2010 *EIR/EIS; Final Bay Area to Central Valley High-Speed Train (HST) Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS*, dated May

2008 and revised in 2010; the *Bay Area to Central Valley High-Speed Train (HST) Revised Final Program Environmental Impact Report (EIR)*, dated August 2010; the *Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Proposed California High-Speed Train System*, dated August 2005; the *Fresno to Bakersfield Section California High-Speed Train Draft EIR/Supplemental Draft EIS,* dated August 2011; and the *Fresno to Bakersfield Section California High-Speed Train Revised Draft EIR/Supplemental Draft EIS*, dated July 2012.

Consultation History

December 1, 2011	The Service received the biological assessment and request for formal consultation for the CHST-MF Project from the FRA.
February 15, 2012	The Service requested further information regarding a Landscape Permeability Plan, estimates of habitat loss and action area, conservation measures, effects analyses for listed species, train operations, and mitigation during the weekly conference call with the California High-Speed Rail Authority (Authority).
February 21, 2012	The Authority submitted supplemental information regarding the Hybrid Alternative, particularly with a more focused analysis of effects of the Hybrid Alternative to federally listed species and updated appendices for the biological assessment.
February 29, 2012	The Authority submitted supplemental information to the Service in response to their February 15, 2012, electronic mail request.
March 7, 2012	The Service provided our request for information and a set of example conservation measures to the Authority via electronic mail.
March 9, 2012	The Authority submitted the Merced to Fresno Section Draft Landscape Permeability Plan (LPP) to the Service.
March 12, 2012	The Authority submitted the MSIP for the Merced to Fresno Section of the California High-Speed Train Project to the Service.
March 14, 2012	The Service participated in a meeting at the Sacramento Fish and Wildlife Field Office, Sacramento, California, with the Authority, California Department of Fish and Game (CDFG), AECOM, and CH2M HILL.
March 15, 2012	The Service provided comments regarding the LPP and the MSIP to the Authority via electronic mail.

March 16, 2012	The Service received some information from the CH2M HILL consultants via electronic mail.
March 21, 2012	The Service participated in a site visit with the Authority, California Department of Fish and Game (CDFG), AECOM, CH2M HILL.
March 27, 2012	The Service provided a checklist for information necessary for formal consultation and the *50 Code of Federal Regulations, Part 402, Interagency Cooperation-Endangered Species Act of 1973, As Amended* to the Authority via electronic mail.
March 28, 2012	The Service participated in a meeting at the AECOM office, Sacramento, California, with the Authority, FRA, CDFG, AECOM, CH2M HILL, and URS, Inc..
April 4, 2012	The Service participated in a meeting at the AECOM office, Sacramento, California, with the Authority, CDFG, CH2M HILL, URS, Inc.
April 5, 2012	The Service provided guidance regarding the LPP to the Authority via electronic mail.
April 16, 2012	The Service received some of the requested information from the Authority via electronic mail.
April 18, 2012	The Service provided clarification regarding our information requests to the Authority via electronic mail.
April 19, 2012	The Service provided additional clarification regarding our information requests to the Authority via electronic mail. The Service participated in a conference call with the Authority and AECOM. The Service received requested information from the Authority via electronic mail.
April 20, 2012	The Service received requested information from the Authority via electronic mail.
April 24, 2012	The Service requested further information from the Authority via electronic mail.
May 8, 2012	The Service received requested information from the Authority via electronic mail.

July 18, 2012	The Authority provided additional information about San Joaquin kit fox conservation measures to the Service via electronic mail.
December 2011 to August 2012	The Service participated in weekly conference calls and email correspondence with the FRA, the California High-Speed Rail Authority (CHSRA), CDFG, AECOM, and CH2M Hill.

BIOLOGICAL OPINION

Description of the Proposed Action

Project overview

The proposed project consists of construction and operation of a rail line to support an inter-city High-Speed Train (HST) from Merced to Fresno. The State of California proposes to build an HST System to connect the major population centers of the San Francisco Bay Area with the Los Angeles metropolitan region. The HST System is envisioned as an electrically powered, high-speed, steel-wheel-on-steel-rail technology with state-of-the-art safety, signaling, and automated train-control systems. The trains will be capable of operating at speeds of up to 220 miles per hour (mph) over a fully grade-separated, dedicated track alignment.

The Merced to Fresno Section alignment of the HST will generally parallel the Union Pacific Railroad (UPRR) Railway in the north and the Burlington Northern Santa Fe (BNSF) Railway in the south. HST stations are proposed for both the City of Merced and the City of Fresno. The alignment will begin at the HST station in downtown Merced, on the west side of the UPRR right-of-way. South of the station in downtown Merced, the alignment will be at grade and cross underneath State Route (SR) 99.

Another component of HST track system will be the configuration of tracks for changing directions. The transition to a wye will require splitting two tracks into four tracks crossing over one another before the wye legs can diverge in opposite directions to allow bidirectional travel. Based on HST design criteria, this transition will require approximately two miles, with an estimated 120-foot-wide right-of-way for the transition before the tracks have fully diverged from each other. Some of the tracks will cross over the opposite northbound or southbound track. The wye will be designed and constructed as part of the San Jose to Merced Section of the HST. Switches will be integrated into the tracks of the Merced to Fresno Section in anticipation of the wye construction. All construction related to the wye switches will occur within the Merced to Fresno Section project footprint.

The California High-Speed Train Final Merced to Fresno Section Project EIR/EIS, dated April 2012 studied two design options that could accommodate a future wye connection to the San Jose to Merced Section of the HST. Under the two design options, near the city of Chowchilla, the alignment will follow one of two routes depicted by the blue lines inside the box in Figure 1.

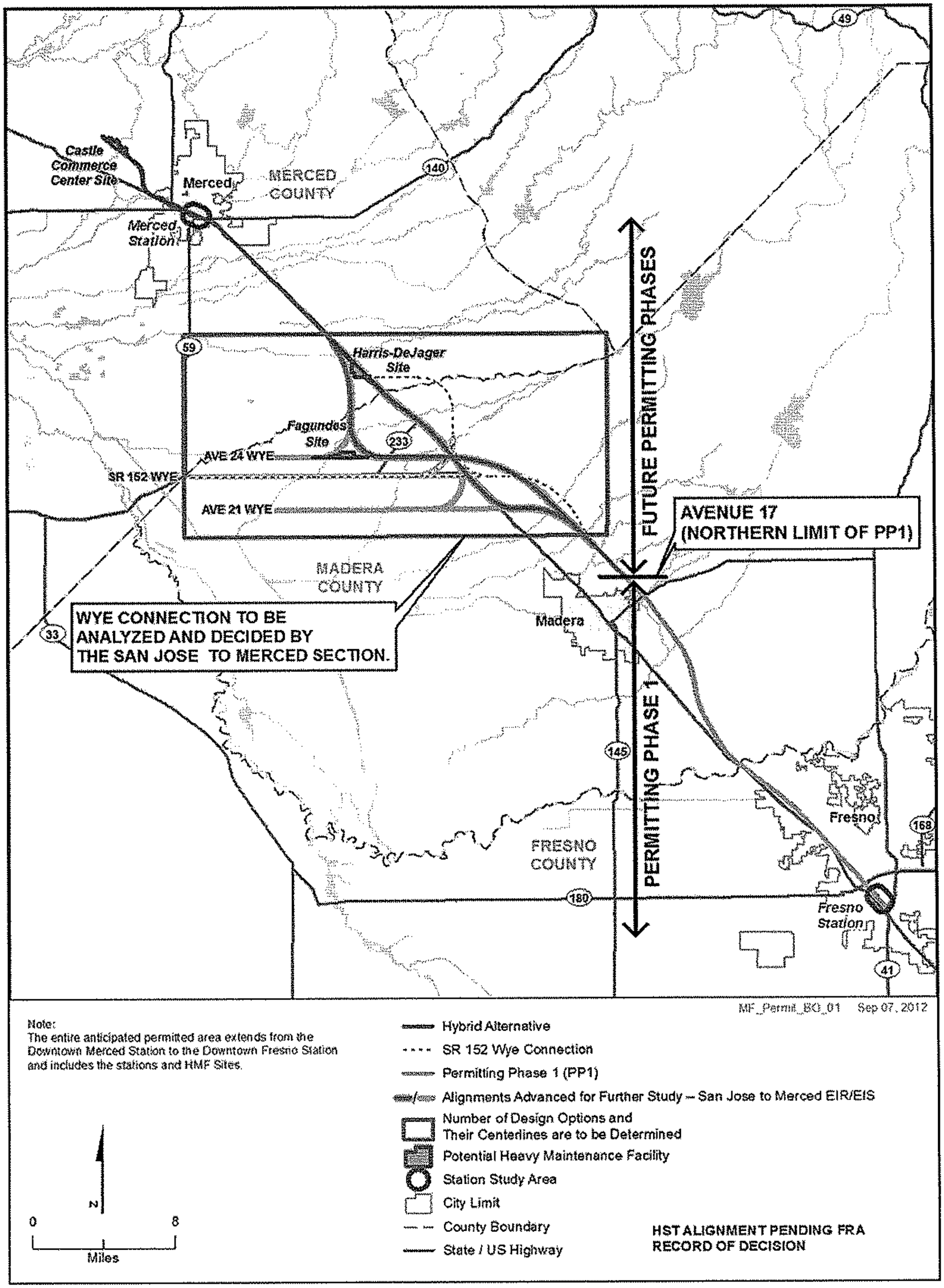
1. Under the first design option, the HST alignment will veer due south from Sandy Mush Road along a curve and continue at grade for 4 miles parallel to and on the west side of Road 11¾. The Merced to Fresno alignment will curve into a corridor on the south side of Avenue 24 and would run parallel for the next 4.3 miles. Along this curve, the southbound HST track will be elevated for approximately 9,000 feet to cross the Ave 24 Wye connection tracks and Ash Slough, and the northbound HST track will remain at grade. Continuing east on the south side of Avenue 24, the HST alignment would diverge into two sets of tracks (i.e., four tracks) beginning west of Road 17. Two tracks would travel north near Road 20½, where they will join the north-south alignment again on the west side of the BNSF Railway corridor near Avenue 26½. The two southbound tracks will join the north-south alignment again on the west side of the BNSF corridor south of Avenue 21.

2. Under the second design option, the HST alignment will transition from the west side of the UPRR Railway and SR 99 to an elevated structure as it crosses the UPRR Railway and North Chowchilla Boulevard just north of Avenue 27, continuing on an elevated structure along the west side of and parallel to SR 99 away from the UPRR corridor while it crosses Berenda Slough. Toward the south side of Chowchilla, the alignment will cross over SR 99 north of the SR 99/SR 152 interchange near Avenue 23½ south of Chowchilla. It will continue to run along the east side of SR 99 until it reaches Avenue 21, where it will curve east and briefly run parallel to Avenue 21. Two tracks will diverge, turning north and south to connect to the north-south alignment west of Road 21. The north leg of the wye will join the north-south alignment just south of Avenue 24, and the south leg would join the north-south alignment just east of Frontage Road/Road 26 north of the community of Madera Acres.

The EIR/EIS for the San Jose to Merced Section will fully evaluate the east-west route alternatives and wye configurations, including, but not limited to, the two wye configurations studied in the Final EIR/EIS for the CHST-MF Project. The FRA and the Authority will identify the preferred east-west alignment, including the preferred wye design option, after the San Jose to Merced Section Project EIR/EIS is circulated. After that decision has been made, the alignment and the profile can be finalized, the FRA will evaluate the final design option to determine whether reinitiation of consultation is required based on whether the final identified design constitutes a modification of the action that would cause an effect to listed species or critical habitat that was not considered in this biological opinion.

The Merced to Fresno alignment will continue at grade through agricultural areas along the west side of the BNSF corridor through the community of Madera Acres north of the city of Madera. South of Avenue 15 east of Madera, the alignment will transition toward the UPRR corridor, following the east side of the UPRR corridor near Avenue 9 south of Madera, then cross the San Joaquin River before entering Fresno. After crossing the San Joaquin River, the alignment will rise over the UPRR Railway on an elevated guideway, supported by straddle bents, before crossing over the existing Herndon Avenue and descending into an at-grade profile and continuing west of and parallel to the UPRR right-of-way.

Figure 1. Proposed High-Speed Train: Merced to Fresno Section.



South of Golden State Boulevard, the alignment will be constructed at grade and cross under the reconstructed Ashlan Avenue and Clinton Avenue overhead structures. Advancing south from Clinton Avenue between Clinton Avenue and Belmont Avenue, the HST guideway will run at grade adjacent to the western boundary of the UPRR right-of-way. The HST guideway will descend in a retained cut to pass underneath the San Joaquin Valley Railroad spur line and SR 180, transition back to being at grade before Stanislaus Street, and continue at grade into the station in downtown Fresno. The Mariposa Street station has been identified as the preferred HST station location in Fresno.

The physical elements of the Merced to Fresno Section will include trainsets, at-grade track and elevated track, road crossings, HST stations (the Merced Station and the Fresno Station), the electrical system and associated facilities (including substations, switching stations, and paralleling stations) that power the train, control and maintenance facilities, the maintenance-of-way facility, access control systems, and potentially one Heavy Maintenance Facility (HMF). As is the case with the Design Options, neither the Authority nor FRA has selected a location for the HMF. It is anticipated that the location of the HMF will be identified after circulation of the Draft EIR/EIS for the San Jose to Merced and Fresno to Bakersfield sections. However, impacts associated with five alternative HMFs within the CHST-MF Project study area were studied in detail in the Final EIR/EIS for the CHST-MF Project, including supporting technical documents. The HMF alternative with the greatest potential impacts to habitat for federally listed species was identified for the purposes of the Service's jeopardy evaluation.

Table 1. Hybrid Alternative Design Options

Design Feature	Design Option 1	Design Option 2
Total length (linear miles)	**76**	**75**
At-grade profile (linear miles)	59	60
Elevated profile[a] (linear miles, including retained fill)	17	15
Number of straddle bents[b]	40	55
Number of railroad crossings	4	6
Number of water crossings	113	113
Approximate number of road closures[c]	37	49
Number of roadway overcrossings	45	48

a. Lengths shown are based on equivalent dual-track alignments. For example, the length of single-track elevated structure will be divided by a factor of 2 to convert to dual-track equivalents.

b. The number of straddle bents was estimated by dividing the preliminary structural span lengths by 100 feet, the assumed spacing between columns/bents. Actual structural configuration would be determined during design.

c. Includes public and private road closures.

The HST System will be designed for the operation of trainsets ranging from 8 to 16 cars that are 9 to 11 feet wide and 660 to 1,320 feet long and designed to operate at a top speed of 220 mph. The current design preference is for a single-level train. The Merced to Fresno Section of the California HST Project will consist of a fully dedicated rail line, constructed from continuous welded steel rail. The Merced to Fresno Section will use four different track profiles: (1) Tracks that are near-the-ground tracks in open areas (i.e., "at grade"); (2) Tracks that are at-grade in constrained areas or transitioning to elevated (i.e., "retained fill"); (3) Tracks that are below-grade (i.e., "retained cut"); and (4) Tracks that are supported by piers or straddle bents (i.e., "elevated track"). The types of bridges that may be installed include multiple short span structures or full channel spans for the smaller natural water courses, while utilizing box culverts or pipes for canals or minor drainage features. The larger river crossings will utilize longer spans, which are limited to the piers within the ordinary high-water channel. The various track profiles are described in Table 1 with reference to the two design options.

At-grade track profiles are best suited in areas where the ground is relatively flat, as in the Central Valley, and in rural areas where interference with local roadways is less. Where the rail line is at grade, the track will be built on compacted soil and ballast material (a thick bed of angular rock) to prevent subsidence or changes in the track surface from soil movement. For at-grade track, the top of the rail will be constructed at a minimum of 4.5 feet above the 100-year floodplain or higher when transitioning to an elevated structure. The height of the at-grade profile may vary to accommodate slight changes in topography, provide clearance for storm water culverts and structures in order to allow water flow, and sometimes wildlife movement.

Retained-cut profiles are used when the rail alignment crosses under existing roads or highways that are at grade. This profile type is only used for short distances in highly urbanized and constrained situations. In some cases, it is less disruptive to the existing traffic network to depress the rail profile under these crossing roadways. Retaining walls will typically be needed to protect the adjacent properties from a cut slope extending beyond the rail guideway. Retained-cut profiles may be used for roads or highways when it is more desirable to depress the roadway underneath an at-grade HST alignment, which may be at grade on either side.
Elevated profiles can be used in urban areas where extensive road networks must be maintained. An elevated profile must have a minimum clearance of approximately 16.5 feet over roadways and 23.5 feet over railroads. Pier supports will typically be approximately 10 feet in diameter at the ground. These types of structures may also be used to cross water bodies; even though the trackway might be at grade on either side, the width of the water channel could require a bridge at the same level, which will be built in the same way as an elevated profile.

When the HST elevated profile crosses over a roadway or a railway on a very large skew (degree of difference from the perpendicular), a straddle bent ensures that the piers are outside the roadway or railway right-of-way. A straddle bent is a pier structure that spans (or "straddles") the functional/operational right-of-way limit of a roadway, highway, or railway. Typical roadway and highway crossings that have a smaller skew angle (i.e., the crossing is nearly perpendicular) generally use intermediate piers in medians and span the functional right-of-way. However, for large-skew-angle crossing conditions, median piers will result in excessively long spans that are not feasible. Straddle bents that clear the right-of-way can be spaced as needed (typically 110 feet apart) to provide feasible span lengths for bridge crossings at large-skew angles.

The Merced to Fresno Section consists of a fully grade-separated and access-controlled guideway in order to maintain local traffic and agricultural access. Unlike existing passenger and freight trains in the project vicinity, there will be no at-grade road crossings in this section, and the HST System will not share its rails with freight trains. There are numerous roadway and State route facilities that currently cross at grade with or over the UPRR and BNSF railroad tracks that may be grade-separated over both the HST and the railroad. Similar conditions occur when an at-grade HST alignment crosses rural roads adjacent to farmland. These overcrossings will generally occur approximately every 2 miles to provide continued mobility for local residents and farm operations.

California's electricity grid will power the HST System. According to the FRA and the Authority, although the HST System would result in increased electricity demand, it would reduce the energy demands from automobile and airplane travel, resulting in an overall beneficial effect on statewide energy use. The Merced to Fresno Section will not include construction of separate power sources, although the extension of power lines existing power substations positioned along the HST project corridor will be included to even out the power feed to the HST System.

The Overhead Catenary System (OCS) will consist of a series of mast poles approximately 23.5 feet higher than the top of rail, with contact wires suspended from the mast poles between 17 to 19 feet from top of rail. The train will have an arm, called a pantograph, to maintain contact with this wire to provide power to the train. The mast poles will be spaced approximately every 200 feet along straight portions of the track down to every 70 feet in tight-turn track areas. The OCS will be connected to the substations described below, required at approximately 30-mile intervals. Statewide, the power supply will consist of a 2-by-25-kilovolt (kV) overhead contact system for all electrified portions of the system.

Based on the HST System's estimated power needs, Traction Power Substations (TPSSs) will each need to be approximately 32,000 square feet (200 feet by 160 feet) and located at approximately 30-mile intervals. TPSSs will accommodate the power supply stations and require a substantial buffer area around them for safety purposes. The TPSS could be screened from view with a wall or fence. Each TPSS site will have a 20-foot-wide access road (or easement) from the street access point to the protective fence perimeter at each parcel location. Each site will require up to a 2-acre parcel. Each substation will include an approximately 450-square-foot control room.

Switching and paralleling stations work together to balance the electrical load between tracks, and to switch power off or on to either track in the event of an emergency. Switching stations will be required at approximately 15-mile intervals, midway between the TPSSs. These stations will need to be approximately 9,600 square feet (120 feet by 80 feet). Paralleling stations will be required at approximately 5-mile intervals between the switching stations and the TPSSs. The paralleling stations will be approximately 8,000 square feet (100 feet by 80 feet). Each station will include an approximately 450-square-foot (18 feet by 25 feet) control room. TPSS, switching stations, and paralleling stations are included in the design as appropriate.

During normal system operations, power will be provided by the local utility service and/or from the TPSS. Should the flow of power be interrupted, the system will automatically switch to a back-up power source, through use of an emergency standby generator, an uninterruptable power supply, and/or a DC battery system. For the Merced to Fresno Section, permanent emergency standby generators are anticipated to be located at passenger stations and at the HMF, and terminal layup/storage and maintenance facilities.

Signaling and train control elements include small signal huts/bungalows within the right-of-way that house signal relay and microprocessor components, cabling to the field hardware and track, signals, and switch machines on the track. These will be located in the vicinity of track switches, and will be grouped with other power, maintenance, station, and similar HST facilities where possible.

Heavy Maintenance Facility

California's HST System includes three types of maintenance facilities (maintenance-of-way facilities, a heavy maintenance facility, and an operations control center). Each section will have maintenance-of-way facilities. A number of overnight layover and servicing facilities will be distributed throughout the HST System. In addition, the HST System will have a single HMF.

Maintenance-of-way facilities will provide for equipment, materials, and replacement parts storage, and support quarters and staging areas for the HST System subdivision maintenance personnel. Each subdivision will cover about 150 miles; the maintenance-of-way facility will be centrally located in the subdivision, no more than 75 miles in each direction. For the Merced to Fresno Section, the maintenance-of-way facility will be co-located with the HMF.

The maintenance-of-way facility will sit on a linear site adjacent to the HST tracks with a maximum width of two tracks, and will be approximately 0.75 mile long for a total size of 26 acres. The track will be approximately 1,600 feet long, will not have electric power, and will be connected to the main line. Access by road for work crews will be required, along with enough space to park work crew vans while working from the site and to drive the length of the track. The track and access area will be within the fenced and secure area of the HST line.

An HST rail heavy vehicle maintenance and layover facility, otherwise known as the HMF, may be located in the Merced to Fresno Section. However, the location of an HMF in this section will be determined by the San Jose to Merced and Fresno to Bakersfield Sections. The HMF alternative within the CHST-MF Project area with the greatest potential impacts to federally listed species will occupy 392 acres with space for all activities associated with train fleet assembly, disassembly, and complete rehabilitation; all on-board components of the trainsets; and overnight layover accommodations and servicing facilities. The site will include a maintenance shop, Operations Control Center building, one traction power substation, other support facilities, and a train interior cleaning platform.

The HMF will have two functions. First, it will support train arrival, assembly, testing, and commissioning to operations. Second, it will become the State's system-wide heavy maintenance workshop. The HMF will support the following functions:

1. Assembly, Testing, and Commissioning: During the pre-revenue service period, the HMF will be used for the assembly, testing, acceptance, and commissioning of the HST System's new trains. Implementation of the testing, acceptance, and commissioning activities will require a mainline test track between 80 and 105 miles in length, connected directly to the HMF. This will also accommodate the equipment decommissioning or retirement of equipment from the system to make way for the future generations of trains.

2. Train Storage: Some trains will be stored at the HMF prior to the start of revenue service.

3. Service Monitoring: Service monitoring will include daily train testing and diagnostics of certain safety sensitive apparatus on the train in addition to automatic on-board and on-ground monitoring devices.

4. Examinations in Service: Examinations will include inspections, tests, verifications, and "quick" replacement of certain train components on the train. Examples include inspection and maintenance tasks associated with the train's running gear, bogies, underbody elements, and pantographs.

5. Inspection: Periodic inspections will be part of the planned preventive maintenance program requiring specialized equipment and facilities. Examples include examination of interior fittings and all train parts, passenger environment, in-depth inspection of axles and underbody components critical to train safety, and/or wheel condition diagnostics and re-profiling (wheel truing).

6. Rolling Stock Modifications and Accident Repair: Rolling stock modifications and accident repair will include major design modifications for improving safety, reliability, and passenger comfort.

7. Overhaul: Part of planned lifecycle maintenance program, overhauls require a specialized heavy maintenance shop with specific heavy-duty equipment. Activities will include complete overhaul of train components. Overhauls will be completed on each trainset every 7 to 10 years (30 days per trainset) and mid-life overhauls will be performed on each trainset every 15 to 20 years (45 days per trainset).

A single, gated entry will control access to the HMF. A two-way, 24-foot-wide circulation road will follow the facility's interior perimeter and a 50-foot-wide asphalt apron will surround the main shop building to provide emergency vehicles access to the structure. About 1,200 to 1,500 employees may be accommodated during peak shifts, including overlapping personnel departures and arrivals. The HMF will require parking for approximately 1,200 vehicles based on an estimate of 80 percent automobile share, and assuming 20 percent of employees will use public transportation or ride-share. In addition, up to 150 parking spaces near the facility will be available for management and administrative personnel, visitors, deliveries, and parking. Some crew, rolling stock preparation personnel, and train yard employees will park their vehicles near the yard tracks. Thus, the plan will include spaces for approximately 50 crew, 50 rolling stock preparation personnel, and 150 yard support employees at full build-out. A pedestrian bridge over the train yard tracks will connect the employee parking lot to the main shop building.

The HMF may house the Operations Control Center on the second floor, and will provide space for employee parking, pedestrian access/egress, and appropriate bathroom and lunchroom facilities. Housing the Operations Control Center in the HMF will minimize costs and impacts because it will not increase the HMF's footprint or require a separate building. If not housed on the HMF site, the Operations Control Center will be housed in an office building where adequate and reliable electronic data connections could be provided for up to 200 employees.

Stations

Stations are sited and designed to allow for connection to local transit, airports, and highways; to maximize the use of existing transportation corridors and rights-of-way; and to develop a practical and economically viable transportation system. The stations contain the following elements:

1. Station buildings of 40,000 to 60,000 square feet that are two to three stories high and contain passenger boarding platforms, ticketing, waiting areas, passenger amenities, employee areas, and baggage and freight handling areas.

2. Parking structures of 5.5 to 7.5 acres in Merced and Fresno.

3. Waiting areas and queuing space for taxis and shuttle buses.

4. Pedestrian connections.

The Downtown Merced and Downtown Fresno station areas will each occupy several blocks, to include station plazas, drop-offs, a multimodal transit center, and parking structures. The areas will include the station platform and associated building and access structure, as well as lengths of platform tracks to accommodate local and express service at the stations. Both the Downtown Merced and Downtown Fresno stations will be at grade, including all trackway and platforms, passenger services and concessions, and back-of-house functions.

The Downtown Merced Station will be between Martin Luther King Jr. Way to the northwest and G Street to the southeast, approximately 7 blocks west of the existing Amtrak station. The station will be accessible from both sides of the UPRR, but the primary station house will front 16th Street. The major access points from SR 99 include V Street, R Street, Martin Luther King Jr. Way, and G Street. Primary access to the parking facility will be from West 15th Street and West 14th Street, just one block east of SR 99. The closest access to the parking facility from the SR 99 freeway will be R Street, which has a full interchange with the freeway. The site proposal includes a parking structure that will have the potential for up to 6 levels with a capacity of approximately 2,250 cars and an approximate height of 50 feet.

The Mariposa Street Station will be located in Downtown Fresno, less than 0.5 mile east of SR 99. The station will be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station building will be approximately 75,000 square feet, with a maximum height of approximately 60 feet. The two-level station will be at-grade, with passenger access provided both east and west of the HST guideway and the UPRR tracks, which will run parallel with one another adjacent to the station. Entrances will be located at both G and H Streets. The eastern entrance will be at the intersection of H Street and Mariposa Street, with platform access provided via the pedestrian overcrossing. The main western entrance will be located at G Street and Mariposa Street.

The station and associated facilities will occupy approximately 18.5 acres, including 13 acres dedicated to the station, bus transit center, surface parking lots, and passenger drop-off areas. A new intermodal facility will be included in the station footprint on the parcel bordered by Fresno Street to the north, Mariposa Street to the south, Broadway Street to the east, and H Street to the west. The site proposal includes the potential for up to three parking structures occupying a total of 5.5 acres. Two of the three potential parking structures will each sit on two acres, and each will have a capacity of approximately 1,500 cars. The third parking structure will have a slightly smaller footprint (1.5 acres), with 5 levels and a capacity of approximately 1,100 cars. Surface parking lots will provide approximately 300 additional parking spaces.

Project roadway modifications

Project roadways modifications will have varying right-of-way (widths) and extent from the HST right-of-way and will include the following:

1. New two-lane overcrossings over the HST right-of-way.

2. Shift of frontage roads (two to four lanes, with shoulders) that parallel the HST right-of-way.

3. Shift of SR 99 two-lane overcrossings and interchanges and associated two-lane roadway connections.

4. Shift of SR 99 between Clinton Avenue and Ashlan Avenue (six lanes) and one new interchange.

Project construction footprint

The HST Project will require acquisition of property necessary for project operation. When the remnant portion of an acquired parcel beyond the right-of-way is too small to sustain current use without other modifications, it will also be acquired. These remnant parcels have been considered a part of the construction footprint, or the total area disturbed during construction and by building the project because they, and could be used for construction staging. The construction footprint or project footprint refers to the entire area of potential permanent impacts associated with the project, including construction, construction staging, and built facilities, such as the track, the stations, electrical facilities, road modifications, crossings, and the HMF sites.

The construction footprint for the Merced to Fresno Section includes staging, laydown, and casting yards for fabrication of the piers or columns for elevated portions of the alignment. All construction staging areas for storage of equipment and materials have been considered directly impacted. If staging areas are needed outside the construction footprint, the Authority or its contractors will be responsible for obtaining all necessary environmental permits. As described in conservation measure 3 below, if the contractor needs to establish a temporary staging area near the San Joaquin River, it will be located at least 50 feet from the channel in order to minimize impacts on the riparian corridor.

If the pre-cast span method is used to build the concrete bridge spans associated with elevated sections, casting yards will be required. Casting yards will be located in the construction footprint. The HST construction area will be fenced and secured. Construction access roads must be inside the construction footprint and will be designed and/or maintained for dust control.

Some disposal of earth unsuitable for reuse in construction (e.g., expansive clays and organic materials) is anticipated. Because the project area is predominantly flat and does not contain geographic barriers, extensive excavation and material removal is not anticipated. The material unsuitable for reuse will be hauled off site to a permitted landfill or sold as fill for another project.

Preconstruction activities

During final design phase, the Authority and its contractor will conduct a number of pre-construction activities to determine how best to stage and manage the actual construction. These activities will include the following:

1. Conducting geotechnical investigations which will focus on defining precise geology, groundwater, seismic, and environmental conditions along the alignment. The results of this work will guide final design and construction methods for foundations, underground structures, tunnels, stations, grade crossings, aerial structures, systems, and substations.

2. Identifying staging areas and pre-casting yards which will be needed for the casting, storage, and preparation of pre-cast concrete segments, temporary spoil storage, workshops, and the temporary storage of delivered construction materials. Field offices and/or temporary job-site trailers will also be located at the staging areas. Construction staging will use the areas within the construction footprint. For example, staging areas may be placed at the future locations of the HST maintenance yards or other facilities. Additional staging areas may be located within other identified parcels within the construction footprint at various points along the HST right-of-way, chosen in part for their easy access to the local road network and highways. As described in conservation

measure 3 below, if the contractor needs to establish a temporary staging area near the San Joaquin River, the staging area will be located at least 50 feet from the riparian corridor in order to minimize impacts on the riparian corridor.

3. Initiating site preparation and demolition, such as clearing, grubbing, and grading, followed by the mobilization of equipment and materials. Demolition will require strict controls to ensure that adjacent buildings or infrastructure are not damaged or otherwise affected by the demolition efforts.

4. Initiating utility relocations, where the contractor will work with the utility companies to relocate or protect in place high-risk utilities such as overhead tension wires, pressurized transmission mains, oil lines, fiber optics, and communications prior to construction.

5. Implementing temporary, long-term, and permanent road closures to re-route or detour traffic away from construction activities. Handrails, fences, and walkways will be provided for the safety of pedestrians and bicyclists.

6. Locating temporary batch plants, which will be required to produce Portland cement concrete (PCC) or asphaltic concrete (AC) needed for roads, bridges, aerial structures, retaining walls, and other large structures. The facilities generally consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; aboveground storage tanks; and designated areas for sand gravel truck unloading, concrete truck loading, and concrete truck washout. The contractor will be responsible for implementing procedures for reducing air emissions, mitigating noise impacts, and reducing the discharge of potential pollutants into storage drains or watercourses from the use of equipment, materials, and waste products.

7. Conducting other studies and investigations, as needed, such as local business surveys to identify business usage, delivery, shipping patterns, and critical times of the day or year for business activities. This information will help develop construction requirements and worksite traffic control plans, and will identify potential alternative routes, cultural resource investigations, and historic property surveys.

Major construction activities

Major construction activities anticipated for the Merced to Fresno Section include earthwork; bridge and aerial construction; road crossing construction; at-grade construction; construction of elevated structures; construction of elevated structures at the San Joaquin River; railroad systems construction; and station construction.

Earthwork: Earth support is an important factor in constructing deep excavations that will be encountered on several alignment sections. It is anticipated that the following excavation support systems may be used along the route. There are three general excavation support categories, which are described below.

1. Open-Cut Slope: Open-cut slope is used in areas where sufficient room is available to open-cut the area and slope the sides back to meet the adjacent existing ground. The slopes are designed similar to any cut slope, taking into account the natural repose angle of adjacent ground material and global stability.

2. Temporary: Temporary excavation support structures are designed and installed to support vertical or near vertical faces of the excavation in areas where room to open-cut does not exist. This structure does not contribute to the final load carrying capacity of the tunnel or trench structure and is either abandoned in place or dismantled as the excavation is being backfilled. This construction component may consist of soldier piles and lagging, sheet piles, slurry walls, secant piles, or tangent piles.

3. Permanent: Permanent structures are designed and installed to support vertical or near vertical faces of the excavation in areas where room to open-cut does not exist. This structure forms part of the permanent final structure, and may consist of slurry walls, secant piles, or tangent pile walls.

Bridge and Aerial Structure Construction: Similar to existing high-speed rail systems around the world, it is anticipated that the elevated guideways will be designed and built using pre-fabricated elements such as single-cell pre-cast-prestressed concrete box span-by-span segmental girder construction. Where needed, other structural types will be considered and used, including steel plate and box girders, steel trusses, various cast-in-place concrete (both reinforced and prestressed), and cable-supported structures.

1. Foundations: A typical aerial structure foundation pile cap is supported by an average of four large-diameter piles with diameters ranging from 5 to 9 feet. Commonly referred to as drilled shafts, they are holes drilled to the design depth and filled with reinforced concrete. Depth of piles depends on geotechnical site conditions. Pile construction can be achieved by using rotary drilling rigs, and either bentonite or synthetic slurry along with temporary steel pipe casings may be used to stabilize pile shaft excavation. The estimated pile production rate varies with the diameter and depth of the drilled hole, with an estimate of 3 to 4 days per pile for installation of the larger diameter elements. Additional pile installation methods available to the contractor include bored piles, rotary drilling cast-in-place piles, driven piles, and a combination of pile jetting and driving.

2. For pile caps constructed near existing structures such as railway, bridges, and underground drainage culverts, temporary sheet piling (i.e., temporary walls) may be used to minimize disturbances to adjacent structures. It is anticipated that sheet piling installation and extraction may be accomplished using vibratory pile driving equipment where impact driving will affect adjacent facilities or sensitive resources.

3. Substructure: Aerial structures with pier heights ranging from 20 to 90 feet may be constructed using conventional slip form and scaffolding methods. A self-climbing formwork system may be used to construct piers and portal beams over 90 feet high. The self-climbing formwork system is equipped with a winched lifting device, which is raised

up along the column by hydraulic means with a structural frame mounted on top of the previous pour. Each 12 feet increment of pour height may be completed over a three-day cycle.

4. The final size and spacing of the piers will depend upon the type of superstructure and spans they will support.

5. Superstructure: It will be necessary to consider the loadings, stresses, and deflections encountered during the various intermediate construction stages, including changes in statical scheme, sequence of tendon installation, maturity of concrete at loading, and load effects from erection equipment. As a result, the final design will depend on the contractor's means and methods of construction and can include several different methods, such as a span-by-span, incrementally launched, progressive cantilever, balanced cantilever, etc. Where structures will be constructed over areas of the San Joaquin River containing sensitive resources, top down methods will be used to the maximum extent feasible to minimize impacts on those resources

Road Crossing Construction: Road crossings of existing railroads, roads, and the HST System will be constructed on the line of the existing road or offline at some locations. When constructed online, the existing road will be closed or temporarily diverted. When constructed offline, the existing road will be maintained in use until the new crossing is completed. Where new roadway undercrossings of existing railroads are required, a temporary shoofly track would be constructed to maintain railroad operations during undercrossing construction.

Construction of At-Grade Sections: Contractors will begin construction of at-grade sections, which may require excavating or leveling the ground surface in areas with highly compressible soils, such as peat or soft clay, are present and cannot be remedied by other means due to construction or cost constraints. Prior to buildup of the track, rough grading will occur within the alignment footprint, and typically excavation to a depth of 3 feet, although excavation of up to 6 feet may be necessary where zones of poor material are encountered. Cut and fill will be balanced to the extent feasible, including for building embankments for nearby overpasses. Contractors will obtain borrow materials from existing, permitted borrow pits and quarries, and complete construction of the rail bed using ballast material from existing permitted quarries.

Construction of Elevated Structures: Contractors may implement various methods of construction for the elevated portions of the Merced to Fresno Section, using cast-in-place (CIP) or pre-cast concrete and structural steel in various combinations. Installation methods and equipment required to install the elements of a structure will vary depending on the method utilized by the contractor. Under the pre-fabricated method, the contractor will produce the various pre-fabricated elements offsite, while concurrently constructing the substructure required to support them at the various locations. Once the substructure is complete, the pre-fabricated elements will be transported to the job site for installation whether they are retaining wall components, part of a column/pier, or the super-structure. Contractors may produce large pre-fabricated bridge segments at a temporary, purpose-built facility, known as a fabrication/casting yard. To provide enough onsite concrete, portable concrete batch plants will be used during construction of the alignment sections. Portable batch plants have a footprint of approximately 2,500 to 3,000 square feet, and will be located so that the duration of concrete hauls to the construction site minimizes potential impacts on the quality of the concrete due to extended travel time once mixed.

Once completed, the contractors will move each pre-fabricated element on a special wheeled transporter to the job site for installation. Depending on the type of pre-fabricated element, the transporters may travel atop the already-completed portion of the viaduct and then feed a segment to a special gantry crane (which will also sit atop the already completed viaduct) that hoists and positions the segment. The contractors will then place the segments on piers constructed prior to arrival of the segments at the site.

The pre-cast span-by-span segmental method of viaduct construction may be implemented because it appears to be less expensive, faster, and results in less schedule uncertainty. However, other methods for viaduct construction include the cast-in-place, box girders, erection of specially designed steel structures, American Association of State Highway and Transportation Officials girders, pre-cast segmental balanced cantilevers, and pre-cast segmental span-by-span.

Construction of Elevated Structures at the San Joaquin River: The HST guideway will be elevated from approximately 1,000 to 1,500 feet north of the north bank of the San Joaquin River to just north of Veterans Boulevard, a distance of between 9,000 and 12,000 feet. The soffit or lowest portion of the structure, spanning the waterway will be a minimum of 10 to 15 feet above the top bank on both sides of the river, providing ample clearance for passage of flood flows and wildlife. The section of the elevated structure or guideway that crosses the San Joaquin River is anticipated to be supported on foundations consisting of CIDH with cast-in-place concrete column extensions.

Currently, the existing UPRR Railway and the Caltrans SR 99 bridge structures downstream from the future crossing have piers in the San Joaquin River corridor that are spaced approximately 160 feet apart. The proposed HST design presents a configuration for a crossing that uses a combination of the typical precast segmental construction at each approach to the crossing and then spans the main low-flow channel with a 160 to 320-foot steel truss superstructure to minimize the need to enter the wetted perimeter of the low-flow river channel. Where required, the construction of foundations within the edge of the active waterway will use construction methods such as installation of sheet pile cofferdams to isolate the activity from the live stream to avoid or minimize the potential for adverse effects on anadromous fish within the Action Area. In addition, both temporary and permanent steel casings for CIDH pile construction and piling for falsework will use vibratory pile hammers for installation, which will minimize underwater sound pressures.

The number of foundation elements will be directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Because the future crossing will be located upstream from the two existing bridge structures, the hydraulic effect of placing new piers in the river corridor on downstream structures and the geomorphology of the channel will be considered during the design of the final configuration of the structure.

Railroad Systems Construction: The railroad systems are to include trackwork, traction electrification, signaling, and communications. After completion of earthwork and structures, trackwork is the first rail system to be constructed, and it must be in place to start traction electrification and railroad signalizing installation. Trackwork construction requires welding of transportable lengths of steel running onto longer lengths (approximately 0.25 mile), which will be placed in position on crossties or track slabs and field-welded into continuous lengths.

Both tie and ballast track construction and slab track construction will be used. Tie and ballast track construction typically requires that crossties and ballast be distributed along the trackbed by truck or tractor. In sensitive areas where the HST is parallel to or in close proximity to streams, rivers, or wetlands, and in areas of limited accessibility, this operation may be accomplished by using the established right-of-way with material delivery via the constructed rail line. A slab track system will be used to construct elevated track and might involve using cast-in-place or precast slabs.

Traction electrification equipment to be installed includes TPSSs and the OCS. TPSSs are typically fabricated and tested in a factory, then delivered by tractor-trailer to a prepared site adjacent to the alignment. The TPSSs will be located every 30 miles along the alignment. The OCS is assembled in place over each track and includes poles, brackets, insulators, conductors, and other hardware.

Signaling equipment to be installed will include wayside cabinets and bungalows, wayside signals (at interlocking), switch machines, insulated joints, impedance bounds, and connecting cables. The equipment will support automatic train protection, automatic train control, and positive train control to control train separation, routing at interlocking, and speed.

Station Construction: For the Merced and Fresno stations, the worksites will be located in urban areas with both commercial and residential land uses nearby. Station improvements will require significant coordination and planning to accommodate safe and convenient access to existing businesses and residences, as well as traffic control during construction periods. The typical construction sequence will be:

1. Demolition and Site Preparation: The contractor will be required to construct detour roadways, new station entrances, construction fences and barriers, and other elements required as a result of taking existing facilities on the worksite out of service. For new facilities, the contractor will be required to perform street improvement work, site clearing and earthwork, drainage work, and utility relocations. Additionally, substations and maintenance facilities are assumed to be newly constructed structures. For platform improvements or additional platform construction, the contractor may be required to realign existing track.

2. Structural Shell and Mechanical/Electrical Rough-Ins: For these activities, the contractor will construct foundations and erect the structural frame for the new station, enclose the new building, and/or construct new platforms and connect the structure to site utilities. Additionally, the contractor will rough-in electrical and mechanical systems and install specialty items such as elevators, escalators, and ticketing equipment.

3. Finishes and Tenant Improvements: The contractor will install electrical and mechanical equipment, communications and security equipment, finishes, and signage. Additionally, the contractor may install other tenant improvements if requested.

Construction Utility Requirements and Waste Disposal

Contractors will need to use water for construction activities such as dust control during demolition of surface and subsurface features, excavation, soil compaction, landscape restoration, concrete work, general cleanup, hygiene, and drinking. If no available water sources exist near the site, then contractors will use tanker trucks, storage tanks, and/or water towers to provide water to the site.

Contractors will temporarily store excavated materials produced by construction activities in within the construction footprint. Wherever possible, they will return excavated soil to its original location to be used as backfill, and dispose waste materials associated with construction, including soils unsuitable for backfill, in landfills permitted to take these types of materials in conformance with ESA.

Construction Materials and Equipment

Materials required for construction include steel rails, building materials for the maintenance facilities, control buildings, and power supply facilities, as well as concrete, reinforcing steel, ballast, cement, aggregates, specialized train system components, fuel, and water. Materials will be delivered and stored at the Merced to Fresno Section project site for use. Various construction types of equipment will be used and staged at the site, including but not limited to cranes, pile drivers, dump trucks, bulldozers, and bucket loaders.

In procuring fill materials to build the grade-separated alignment, the Authority will attempt to identify available material from existing quarries as close to the construction site as practicable. For soils used as temporary fill material within the San Joaquin River, the contractor will be required to use native soils similar to that within the Action Area. In procuring fill materials to build the grade-separated alignment, the contractor will source the materials in conformance with the California Department of Transportation's, and other standard engineering specifications.

Construction timeline

The Authority intends to begin final design and project construction in 2013, with construction of the Initial Operating Section (IOS) first construction to be completed by December 2018. Service on the IOS is expected to start in 2017. The Authority's Revised 2012 Business Plan for the

California HST System specifies that of the Initial Operating Section (IOS) will connect the Central Valley and San Fernando Valley with operation of the IOS starting in 2022. The IOS first construction, a 130-mile segment that extends from north of Fresno to Bakersfield, will provide the track and structures to support the system spine. The IOS includes construction of new high speed infrastructure in the Central Valley. The CHST-MF Project, including permit Phase 1, is part of the first construction of the IOS.

The Merced to Fresno Section will be built using a Design/Build (D/B) approach, which is a method of project delivery where one entity works under a single contract with the project owner to provide design and construction services. This differs from the "design-bid-build" approach, where design and construction services are managed under separate contracts and the design is completed before the project is put out for construction bids. The D/B approach offers greater flexibility to adapt the project to changing conditions. The contract with the D/B contractor will require compliance with standard development practices and regulations, as well as implementation of any project design features and all applicable conservation measures.

One or more D/B packages will be developed and the Authority will then issue construction requests for proposals, start right-of-way acquisition, and procure construction management services to oversee physical construction of the project. During peak construction periods, work is envisioned to be under way at several locations along the route, with overlapping construction of various project elements. The overall general sequence of construction is presented in Table 2.

Table 2. Construction Sequence.

Activity	Tasks	Average Durations (Months)
Right-of-way acquisition	Per Assembly Bill 3034, proceed with right-of-way acquisitions after the state legislature appropriates funds in the annual budget.	18–24
Survey and preconstruction	Locate utilities, establish right-of-way and project control points and centerlines, and establish or relocate survey monuments.	6–8
Mobilization and site preparation	Relocate utilities, and clear and grub right-of-way (demolition); establish detours and haul routes; erect safety devices and mobilize special construction equipment; prepare construction equipment yards and stockpile materials; and establish precast concrete segment casting yard.	8–12
Heavy construction	Construct aerial structures, grade separations, highway realignments, surface streets, and major facilities (e.g., maintenance, stations).	30–36
Medium construction	Lay tracks, install drainage facilities, conduct backfilling operations, and perform street paving.	6–9
Light construction	Install and test systems (e.g., train control systems, overhead contact system, communication system); install traffic signals, street lighting, and striping; close detours; and clean up site.	12–18

Project construction will generally occur in 8-hour shifts between 7 a.m. and 7 p.m., 6 days per week. Occasionally, double shifts might also be required and will be subject to local regulations regarding construction hours. Whenever feasible and where local ordinances allow, contractors might work on Sundays.

The Authority plans to prioritize construction of a portion of the Merced to Fresno Section. The first construction segment of the IOS is Construction Package 1 which includes a segment between the cities of Madera and Fresno. Construction Package 1 includes a 29-mile section scheduled to begin in early 2013. The construction schedule is presented in Table 3.

Table 3. Construction Package 1 Schedule.

Phase	Tasks
Mobilization	Mobilize safety devices and special construction equipment.
Site preparation	Relocate utilities; clear/grub right-of-way; establish detours and haul routes; and prepare construction equipment yards, stockpile materials, and precast concrete segment casting yard.
Earth moving	Excavate for earth support structures.
Construction of road crossings	Modify surface streets, and make grade separations.
Construction of aerial structures	Construct aerial structure and bridge foundations, substructure, and superstructure.
Track laying	Perform backfilling operations, and construct drainage facilities.
Systems	Potential construction of train control systems, overhead contact system, and communication system, and install signaling equipment.
Demobilization	Clean up site.

Operations and maintenance

Train Service: After the HST is constructed, three categories of trains will be operated (Parsons Brinkerhoff 2008). Express trains will run between major stations (e.g., San Francisco, Los Angeles, and San Diego). An express train could make the trip between San Francisco and Los Angeles in 2 hours and 40 minutes. Express trains will not stop at and will travel through the two HST stations in the Merced to Fresno Section on dedicated through-tracks. Limited-stop trains will provide service to some intermediate stations, as well as to the major stations. Frequent-stop trains will make all stops between the two terminus stations and will focus on regional service. Trains will not pass each other within an interval of three minutes or less.

The conceptual HST service plan for Phase 1 begins with service between Anaheim/Los Angeles running through the Central Valley from Bakersfield to Merced, and traveling northwest into the Bay Area. Subsequent stages of the HST System include a southern extension from Los Angeles to San Diego via the Inland Empire and an extension from Merced north to Sacramento.

Trains will run in diverse patterns between various terminals (Parsons Brinckerhoff 2008). Three basic service types are proposed:

1. Express trains, which will serve major stations only, providing fast travel times; for example, between Los Angeles and San Francisco during the morning and afternoon peak with a run time of 2 hours and 40 minutes.

2. Limited-stop trains, which will skip selected stops along a route to provide faster service between stations.

3. All-stop trains, which will focus on regional service.

The vast majority of trains will provide limited-stop services and offer a relatively fast run time along with connectivity among various intermediate stations. Numerous limited-stop patterns will be provided, to achieve a balanced level of service at the intermediate stations. The service plan envisions at least four limited trains per hour in each direction, all day long, on the main route between San Francisco and Los Angeles. Each intermediate station in the Bay Area, Central Valley between Fresno and Bakersfield, Palmdale in the High Desert, and Sylmar and Burbank in the San Fernando Valley will be served by at least two limited trains every hour—offering at least two reasonably fast trains an hour to San Francisco and Los Angeles. Selected limited-stop trains will be extended south of Los Angeles as appropriate to serve projected demand. Trains will not pass each other within an interval of three minutes or less.

Including the limited-stop trains on the routes between Sacramento and Los Angeles, and Los Angeles and San Diego, and the frequent-stop local trains between San Francisco and Los Angeles/Anaheim, and Sacramento and San Diego, every station on the HST network will be served by at least two trains per hour per direction throughout the day, and at least three trains per hour during the morning and afternoon peak periods. Stations with higher ridership demand will generally be served by more trains than those with lower estimated ridership demand.

The service plan provides direct train service between most station pairs at least once per hour. Certain routes may not always be served directly, and some passengers will need to transfer from one train to another at an intermediate station, such as Los Angeles Union Station, to reach their final destination. Generally, the Phase 1 and full-build conceptual operations and service plans offer a wide spectrum of direct service options and minimize the need for passengers to transfer.

Specifically for the Merced to Fresno Section, trains will take approximately 25 minutes to run between Merced and Fresno. The maximum operating speed will reach 220 mph in this section. In Phase 1 the first train will start from Merced after 5 a.m. at the earliest, and the last train will arrive before midnight. In the full system, trains will originate from Sacramento no earlier than 5 a.m., arriving in Merced before 6 a.m. In the late evening, the last train to Sacramento will pass through Merced shortly after 11 p.m. and reach Sacramento before midnight.

The Merced and Fresno stations will see a mix of stopping trains and through trains peaking for the full system. In 2035 for the high ridership scenario, the full system will see four trains an hour stop at Fresno in each direction at the peak, and six trains run through. At the off-peak the same number of stops will be made, but the through trains will drop to three per hour. At Merced, three trains will stop each hour per direction at the peak, with two running through. At the off-peak both of the two hourly trains will stop at Merced.

Lighting: In general, the right-of-way will not be lighted except at stations and associated maintenance and electrical facilities. Station lighting will be designed to provide safety for arriving and departing passengers within urban areas. Maintenance and electrical facilities will have permanent lighting for both interior and exterior areas, as needed to support operations, including those requiring lighting 24 .hours per day. Typically, exterior lights will be mounted on tall masts, towers, or poles, and flood the area with sodium or mercury-vapor light. The lights will be angled toward the ground to limit reflectance on the surrounding community.

Maintenance and Inspection Activities: During operation of the HST System, programmed inspection and maintenance will be performed to verify that the project components are functioning as required. A maintenance-of-way program will be instituted to schedule inspection and maintenance activities. The maintenance-of-way program has two types of activities: preventative maintenance and corrective maintenance. Preventative maintenance will maintain the quality of the system and aid in defining a maintenance cycle for each project component type. Corrective maintenance will establish the level of performance of the infrastructure for both safety and comfort. Corrective maintenance is anticipated to be performed within the rail line right-of-way during off-peak hours of operation, or at power supply system facilities. Corrective maintenance will consist of light maintenance, heavy maintenance, or major renewals. Regular maintenance for the HST will include the following activities:

1. Inspection and repair of the rail line, the power supply system, and the maintenance facilities.

2. Vegetation control monthly to several times per year.

3. Maintenance of ballasted track every 4 to 5 years.

4. Culvert replacement along road crossings and debris clearance from the rail lines, as necessary.

5. Regular inspection of foundation elements at river crossings, such as the San Joaquin River crossing, are expected to occur on a bi-annual basis for exposed elements (accessible on foot or by light vehicle) and on a 5-year cycle for the inspection of components which are underwater and require a dive team for the process.

6. Regular clearing and removal of vegetation and sediment at the dedicated wildlife crossings to allow these structures to be free of obstruction and maintain their function.

7. Long-term maintenance may include intermittent activities, such as replacing short lengths of rail or ballast.

Conservation measures

The project proponent proposes to avoid or minimize effects to listed species and their respective habitats through the following conservation measures, which will be further developed, implemented and tracked pursuant to the Biological Resources Management Plan (BRMP) referenced in conservation measure 6, below:

1. At least 15 days prior to the onset of activities, the Authority will submit the name(s) and resumes of biologists and other qualified staff who will conduct activities specified in the following measures. No project activities will begin until proponents have received written approval from the Service that the biologists are approved to conduct the work. The following roles and definitions represent the lead biology positions responsible for monitoring, reporting, and implementing proposed conservation measures and terms and conditions of the biological opinion. Restoration ecologists, landscape architects, and special-status species experts may also be contracted for assistance with implementation of proposed conservation measures.

    a. **Service-approved project biologist:** The Service-approved project biologist will represent the construction management team, report directly to the construction management team, and will be responsible for reporting and overseeing the biological resources mitigation measures presented in the Final California HST Merced to Fresno Section EIR/EIS. The Service-approved project biologist will also be responsible for confirming that all conservation measures and terms and conditions in the biological opinion are included in the Mitigation Monitoring and Reporting Program (MMRP). The Service-approved project biologist will report to the Service-approved mitigation manager, coordinate with the resident engineer, and ensure implementation of all conservation measures and mitigation plans by the contractor and Service-approved contractor's biologist, and advise the contractor regarding measures that may minimize or avoid impacts on federally listed species.. The Service-approved project biologist will have specialized support from other biological monitors and will work with the Service-approved mitigation manager during deployment of the biological monitors and their respective responsibilities. The Service-approved project biologist will submit memorandum and reports to document compliance with all conservation measures to the mitigation manager at daily, weekly, and monthly intervals.

    b. **Service-approved mitigation manager:** The Service-approved mitigation manager is responsible for overseeing implementation and compliance with all project-related conservation measures and provide guidance to the construction management team. The Service-approved project biologist will report to the mitigation manager to verify compliance with all conservation measures.

c. **Service-approved contractor's biologist**: The Service-approved contractor's biologist will be responsible for implementing conservation measures and ensuring compliance with all terms and conditions in the biological opinion. The Service-approved contractor's biologist will implement all conservation measures. The Service-approved contractor's biologist will keep the Service-approved project biologist informed regarding the progress, planning, implementation of conservation measures, and other activities.

d. **Service-approved biological monitors**: The Service-approved biological monitors will report directly to the Service-approved project biologist. The Service-approved biological monitors will be remain onsite during all project-related activities that have the potential to affect biological resources and will be the principal agent(s) in the direct implementation of all conservation measures and compliance assurance. The Service-approved biological monitor will be responsible for Worker Environmental Awareness Program (WEAP) training, general surveys, compliance monitoring, and reporting. The Service-approved biological monitors will act on behalf of the Service-approved project biologist.

2. If requested, before, during, or upon completion of construction activities, the contractor will allow access by the Service to the construction site. All visitors will check in with the resident engineer prior to accessing the construction site for compliance with on-site safety regulations. A memorandum prepared by the Service-approved project biologist within one day documenting agency access and issues raised during the field meeting will be submitted to the Service-approved mitigation manager and the Service. Any non-compliance issues will be immediately reported to the Authority.

3. As much as practicable, construction staging will use the same areas that will ultimately be occupied by permanent HST facilities. Prior to ground-disturbing activities, the Contractor will locate staging areas for construction equipment outside sensitive biological resources, including habitat for listed species, wetlands and riparian habitat, and wildlife movement corridors, to the maximum extent possible.

4. Contractors will temporarily store excavated materials produced by construction activities in designated areas at or near the construction site. Wherever possible, they will return excavated soil to its original location to be used as backfill, and dispose waste materials associated with construction in local landfills permitted to take these types of materials. Material unsuitable for reuse would to be hauled offsite to a permitted location.

5. Prior to construction activities, the Service-approved mitigation manager or designee will prepare and implement a WEAP for construction crews. WEAP training materials will include the following: discussion of the Act and other applicable laws and regulations; consequences and penalties for violation or noncompliance with these laws and regulations and project permits; identification and value of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities; hazardous substance spill prevention and containment measures; the contact person in the event of

the discovery of a dead or injured wildlife species; and review of mitigation measures. The Service-approved mitigation manager will detail construction timing in relation to habitat and species' life stage requirements and discuss project maps, showing areas of planned minimization and avoidance measures within the WEAP. A fact sheet conveying this information will be prepared by the Service-approved mitigation manager for distribution to the construction crews and to other individuals who enter the construction footprint. Upon completion of the WEAP training, construction crews will sign a form stating that they attended the training, understand the information presented and will comply with all conservation measures and applicable regulations. Construction crews will be informed during the WEAP training that travel within the marked project site will be restricted to established roadbeds. Established roadbeds include all pre-existing and project-constructed unimproved, as well as improved roads.

6. During final design, and prior to construction, the Service-approved project biologist will prepare the BRMP and assemble all the biological resources conservation and mitigation measures. In the BRMP, the Service-approved project biologist will include terms and conditions from applicable permits and agreements and make provisions for monitoring assignments, scheduling, and responsibility. The BRMP will also include habitat replacement and revegetation protection during construction activities, performance (growth) standards, maintenance criteria, and monitoring requirements for temporary and permanent native plant community impacts. The BRMP will be prepared for all phases of project implementation, and may be exclusively prepared for each construction package

   The goal of the BRMP will be to provide the Service-approved project biologist with an organized reporting tool to ensure the mitigation measures and terms and conditions are implemented in a timely manner and are reported on. These will include all conservation measures, repair, mitigation, and compensatory actions included in the biological opinion. These measures and conditions will be tracked through final design, implementation, and post-construction phases. Specific performance standards will be habitat-based and related to success of onsite or offsite repair of temporary impacts, or more permanent impacts that are compensated at an offsite location. The BRMP will assist in the long-term conservation and recovery of listed species and their respective habitats within the temporarily disturbed areas, as well as protect adjacent targeted habitats. The BRMP will contain but not be limited to the following information:

   a. Specific measures for the protection of listed species.

   b. Identification (on construction plans) of the locations and quantity of habitats to be avoided or removed, including locations where habitats are to be restored.

   c. Procedures for vegetation analyses of temporarily impacted habitats to approximate their relative composition, as well as procedures for site preparation, irrigation, planting, and maintenance. This information may be used to determine the requirements of the revegetation areas for both onsite temporary impacts and offsite compensatory sites.

d. Sources of plant materials and methods of propagation.

e. Specific parameters for determining the amount of replacement habitat for temporary disturbance areas identified consistent with mitigation ratios and permit conditions.

f. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas.

7. Prior to construction activities, the contractor will prepare and implement a Weed Control Plan (WCP) to minimize or avoid the spread of weeds during construction activities. The contractor will implement the WCP during the construction period and require that maintenance crews follow the guidelines in the WCP during the project period. The Authority or its designee will appoint the responsible party for implementing the WCP during the operations period. The WCP will include the following:

   a. Schedule for conducting noxious weed surveys to be conducted in coordination with the BRMP.

   b. Success criteria for noxious and invasive weed control as established by a qualified biologist.

   c. The success criteria will be linked to the Habitat Mitigation and Monitoring Plan (HMMP) for compensatory mitigation sites, and the standards for onsite work during construction will limit invasive species to less than 5 percent and non-native herbaceous species to less than 25 percent. If these success criteria have not been met by the end of the BRMP monitoring and implementation period, monitoring and control efforts will continue and remedial actions will be identified and implemented until success criteria are met.

   d. Based on monitoring results, additional or revised measures may be needed to ensure the introduction and spread of noxious weeds is not promoted by the construction and operation of the HST.

   e. Provisions to ensure that the development of the Weed Control Plan will be coordinated with development of the Restoration and Revegetation Plan (RRP) so that the RRP incorporates measures to reduce the spread and establishment of noxious weeds and incorporates percent cover of noxious weeds into revegetation performance standards.

   f. Identify weed control treatments including permitted herbicides, and manual and mechanical methods for application. Restrict herbicide application from use in environmentally sensitive areas (ESAs).

g. Determine timing of the weed control treatment for each plant species.

h. Identify fire prevention measures.

8. During final design, the Service-approved contractor's biologist will prepare a restoration and revegetation plan (RRP) for upland communities and verified by the Service-approved project biologist. This will be a complement for site restoration in addition to the temporary effects for riparian plant communities and for jurisdictional waters. The RRP will address impacts to habitat subject to temporary ground disturbances, such as de-compaction or regrading. The standards during construction will limit invasive and non-native plant species to less than 5 percent. The Service-approved project biologist will approve the seed mix. During construction activities, the contractor will implement the RRP in temporarily disturbed areas. The Service-approved project biologist will prepare and submit compliance reports to document implementation of this measure. The RRP compliance reports will be prepared and submitted to the Service-approved mitigation manager.

9. Work within the wetted perimeter of the river channel is assumed to occur between June 15 and October 15 to minimize impacts on aquatic species and other aquatic resources.

10. Where the Central Valley Flood Protection Board (CVFPB) has defined the limits of a designated floodway, work within those limits may be restricted during the wet season for flood protection issues unless otherwise authorized by the CVFPB.

11. Material and equipment storage within close proximity to the river channel areas will be limited to the restricted period from April 15 to October 31. Equipment may enter into the restricted river channel areas but will be removed daily and stored outside of the areas subject to flooding.

12. Prior to initiation of construction activities, Service-approved biologists will conduct preconstruction survey(s) for special-status species (wildlife and plants) and special aquatic resources. Pre-construction surveys will be conducted in general accordance with the appropriate technical guidance documents approved by the Service.

13. Personnel who work onsite will attend a contractor education and environmental training session. The environmental training will cover general and specific biological and legal information on federally listed species and their habitats. The training sessions will be given by Service-approved biological monitors before the initiation of construction activities and repeated, as needed. Daily updates and synopsis of the training will be performed during the daily safety ("tailgate") meeting. HST maintenance crews will be required to attend a contractor education and environmental training annually.

14. Prior to construction activities, to the extent practicable, the Service-approved project biologist will verify that environmentally sensitive areas (ESAs) and environmentally restricted areas (ERAs) are delineated as appropriate. ESAs are areas within the

construction zones containing suitable habitat for special-status species and habitats of concern that may allow construction activities, but have restrictions based on the presence of special-status species or habitats of concern at the time of construction. ERAs are areas outside the construction footprint that must be protected in-place during all construction activities.

15. Prior to construction activities, the Service-approved contractor's biologist will include all ESAs and ERAs on final construction plans (including grading and landscape plans). Prepare, review and approve the map of all ESAs and ERAs on the design drawings and work to update the map as necessary.

16. Prior to construction activities, the Contractor will mark ESAs and ERAs with high visibility temporary fencing to prevent encroachment of construction personnel and equipment onto sensitive areas. Designate the two categories, ESA and ERA, differently in the field (e.g., different colored flagging/fencing). Sub-meter accurate GPS equipment will be used to delineate all ESAs and ERAs. Remove ESA and ERA fencing when construction is complete or the resource has been cleared according to agency permit conditions in the MMRP and construction drawings and specifications. The Service-approved project biologist will submit a report regarding the field delineation of all ESAs/ERAs to the Mitigation Manager. These areas will be monitored during all site preparation and construction activities.

17. A Service-approved biological monitor will be present onsite during key construction activities, including during ground-disturbance activities and for all construction activities conducted within or adjacent to identified Environmentally Sensitive Areas, Environmentally Restricted Areas (ERAs), Wildlife Exclusion Fence (WEF) zones, or non-disturbance zones to oversee permit compliance and monitoring efforts.

18. Fencing will be used to establish non-disturbance exclusion zones to restrict construction equipment and personnel from entering Environmentally Sensitive Areas or restrict wildlife species from entering the construction areas. Environmentally Sensitive Areas and ERAs will include sensitive habitats that may support federally listed species and areas within limits of indirect effect for federally listed species, as identified by the regulatory agencies in their permit documents. Two types of fencing will be used for these purposes. Environmentally Sensitive Area fencing will be located and depicted on the project plans and delineated in the field by the biological monitor. The contractor will ensure that all Environmentally Sensitive Areas and ERAs are off-limits to construction personnel and equipment. Species-appropriate WEF will be installed along the outer perimeter of Environmentally Sensitive Area fencing.

19. A combination of temporary wildlife crossings and permanent designated wildlife crossings will be incorporated during construction to mirror the proposed spacing of dedicated wildlife crossings post-construction as specified in the LPP and the *Memorandum: Dedicated Wildlife Crossings for the Merced to Fresno Section of the California High-Speed Train System*. Therefore, during construction, temporary or

permanent wildlife crossings will be spaced at approximately 0.3-linear mile intervals within the Eastman Lake-Bear Creek Essential Connectivity Area (ECA). Outside of the ECA where adjacent land uses are relatively conducive to wildlife movement (e.g., grazing land; grain, hay, and idle pasture), temporary or permanent wildlife crossings would be spaced at no more than 2.5-linear mile intervals. In areas outside of the ECA where adjacent land uses are not conducive to wildlife movement (e.g., vineyards, high-density development), temporary or permanent wildlife crossings would be spaced at no more than 5-linear mile intervals.

20. Federally listed wildlife species detected within the limit of direct effect during construction may be relocated by the Service-approved biological monitor in accordance with agency guidance, if deemed necessary and approved by the Service.

21. Temporarily disturbed biological communities or habitats that could support federally listed species and special aquatic resources will be restored to pre-project conditions. Restoration activities will include, but not limited to, the following: grading landform contours to approximate pre-disturbance conditions, removal of invasive plant species, and revegetating temporarily disturbed areas using native plant species to the extent possible, and using certified weed-free straw and mulch. A site restoration plan will be prepared to identify appropriate restoration activities, establish a monitoring schedule, describe the materials that should be used, identify timing of the work, identify monitoring requirements and success criteria, and recommend contingency measures. All restoration plans will be submitted to the Service for review and approval prior to implementation.

22. During construction, equipment will be washed before entering and leaving the work area. Mud and foreign plant materials will be removed from construction equipment when working in native plant communities, near sensitive biological communities, or in areas where special-status plant species have been identified.

23. In order to minimize dust production, a speed limit of 20 mph will be enforced during project construction for all vehicles operating in temporary and permanent construction areas within the limit of direct effect.

24. Prior to construction activities, the contractor will locate staging areas for construction equipment outside sensitive biological resources including habitat for special-status species, habitats of concern(e.g., wetlands, waters of the U.S., riparian communities), and wildlife movement corridors, to the maximum extent possible. The Service-approved project biologist will submit memoranda to the Service-approved mitigation manager documenting compliance with this measure.

25. During construction activities, the Service-approved project biologist will verify that plastic mono-filament netting (erosion-control matting) or similar material is not used in erosion control materials; substitutes include coconut hair matting or tackified hydroseeding compounds. The Service-approved project biologist will submit

memoranda to the Service-approved project mitigation manager documenting compliance with this measure on a monthly basis throughout the duration project construction activities.

26. During construction activities, the contractor will restrict project-related vehicle traffic, within the construction area, to established roads, construction areas, and other designated areas. Establish vehicle traffic locations disturbed by previous activities to prevent further adverse effects. Clearly flag and mark access routes and prohibit off-road traffic.

27. The Service-approved contractor's biologist will cover all excavated, steep-sided holes or trenches, more than 8 inches deep, at the close of each working day with plywood or similar materials, or provide a minimum of one escape ramp per 10 feet of trenching constructed of earth fill. The Service-approved contractor's biologist will thoroughly inspect such holes or trenches for trapped animals before leaving the construction site each day. The Service-approved contractor's biologist will screen all culverts, or similar enclosed structures, with a diameter of 4 inches or greater to prevent use by wildlife. The Service-approved contractor's biologist will ensure that cleared and stored material at the construction site for common and special-status wildlife species before the material is subsequently used or moved.

28. During construction activities, the Service-approved project biologist or Service-approved project biological monitors will halt work in the event that a special-status wildlife species gains access to the construction footprint. This work stoppage will be coordinated with the resident engineer and/or the Authority or its designee. The work stoppage will occur within the area where the potential construction activity could affect the species; other work may continue. This will be determined prior to direction given to the contractor. At this direction, the contractor will suspend construction activities in the immediate construction area that could reasonably result in a "take" of special-status wildlife species. The contractor will continue the suspension until the individual leaves voluntarily or safely relocated to an appropriate site per Service approval. The Service-approved project biologist will submit a report to the Service-approved mitigation manager documenting compliance with this measure within one day of the work stoppage and subsequent action.

29. The Service-approved contractor's biologist in coordination with the Service-approved project biologist and Service-approved mitigation manager will notify the Service, the CDFG, and the Authority or its designee immediately, via telephone and email, in the case of an accidental death or injury to a federal or state listed species during project-related activities.

30. After each construction period is completed, the Service-approved project biologist will submit post-construction compliance reports consistent with Service protocols and compliance with the Act.

31. A mitigation plan has been proposed by the Authority for the Merced to Fresno Section to compensate for the permanent loss of habitat and provide long-term habitat conservation for the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, and the succulent owl's-clover.

The Draft MSIP was submitted to Service for review and comments in March 2012. An updated Draft MSIP was submitted in July 2012. The MSIP includes: (1) a comprehensive approach designed to mitigate project effects on the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover and their respective habitats; (2).a proposed methodology for determining appropriate compensation; (3) an analysis of mitigation sites; and (4) a mitigation package to provide conservation value for, and mitigate the Merced to Fresno Section's effects on sensitive biological resources, including listed species.

The MSIP employs a comprehensive, landscape-scale approach to habitat conservation that seeks to increase the amount of conserved wetlands and protected habitat for special-status species, preserve and enhance important wildlife movement corridors, and consolidate and expand existing protected habitat.

The Draft MSIP includes a proposal to secure conservation easements, and develop long-term management plans, for a number of permittee-responsible mitigation sites, including Grasslands, Lazy K, Dutchman Creek, and Roen. The list of potential permittee-responsible mitigation sites identified in the Draft MSIP has not been finalized and is subject to augmentation with Service approval. These permittee-responsible mitigation sites were selected based on their relatively high conservation value (e.g., proximity to other protected habitats or conserved areas, location within important wildlife movement corridors, recovery areas, or designated critical habitat, the presence of listed species and/or suitable habitat, and ability to satisfy the requirements of the Service and other permitting agencies). The permanent protection of the permittee-responsible mitigation sites would also support goals identified in the recovery plan for vernal pool plants and crustaceans by protecting habitat within key vernal pool core areas; support goals identified in the recovery plan for San Joaquin kit fox by protecting habitat within key wildlife movement corridors; and protect habitat that the Service has deemed critical for the survival and recovery of listed vernal pool plants and crustaceans. For all proposed mitigation sites, long-term management plans, conservation easements, and funding analyses for the long-term endowments will be submitted to the Service for review and approval before the plans are finalized and implemented.

The Authority has proposed phasing of the mitigation strategy in accordance with the progress of construction of the Merced to Fresno Section. Phase 1 covers the distance from Avenue 17 in Madera County to (and including) the Fresno Station. Effects associated with Phase 1 will be mitigated before or at the onset of construction of Phase 1. The timing and extent of subsequent permitting phases is not known at this time, but implementation of permittee-responsible mitigation that is consistent with the MSIP for Phase 1 and each future phase of construction for the Merced to Fresno Section will commence on or before the commencement of construction for each respective project phase pursuant to condition 3. The Authority anticipates that effects associated with Phase 1 and future permitting phases will be mitigated before or concurrently with each of those respective phases. The Authority may propose advance mitigation for the remainder of the Merced to Fresno Section.

San Joaquin kit fox

1. The following measures are proposed to allow movement of San Joaquin kit foxes and maintain connectivity among populations of this species within and around the project action area:

    a. Dedicated wildlife crossings (17 to 24) will be constructed throughout wildlife corridors identified for movement of San Joaquin kit fox. Two types of designs are proposed and will be incorporated into engineering designs based on topography. The primary design for dedicated wildlife crossings will use one of two basic concrete structure types (box culverts or short span slab bridges) to provide an opening located below the tracks of the HST. The choice of structure used to provide the opening will depend on the height of the embankment supporting the track at a given location. The primary design will provide a minimum opening 3 feet high, 10 feet wide, and up to 73 feet long, resulting in an openness factor (OF) of 0.41 as measured by (Height × Width)/Length. The length of the crossing would be reduced whenever possible to increase the OF as much as possible. Where feasible from an engineering perspective, and appropriate from an ecological perspective, dedicated wildlife crossings would be constructed with larger openings. The dimensions of these larger wildlife structures will be 6 feet high and 10 feet wide and about 73 feet long.

    b. The length of the crossing will be reduced whenever possible to improve the OF and reduce cost. To accommodate variations in the topography, the height of the structure could extend as much as 18 inches below grade; however, at least 50 percent of the vertical clearance would be above grade. This will allow San Joaquin kit fox entering the crossing to be able to see light coming from the opposite end of the structure.

    c. At locations where swales are constructed parallel to the track embankment to control stormwater, they would be designed to terminate at the crossing to prevent water from ponding in the structure. The path would be shaped to drain to the sides, and small retention basins would be provided adjacent to the path to collect runoff. These features would keep the crossing passable during normal rain events.

d. Right-of-way fencing will be diverted toward the toe of the slope, up the embankment, and above the entrance of the structure, thus allowing unimpeded access to the crossing structures for San Joaquin kit fox.

e. For each crossing, four sections of corrugated metal pipe (CMP), 20 feet long and 10 inches in diameter, would be anchored to either the floor or the wall of the crossing. The openings of both ends of all CMPs would be narrowed to a 4 to 6 inch diameter. San Joaquin kit foxes will gain temporary refuge opportunity within the CMPs in the event they find themselves in a culvert with a larger predator.

f. The spacing and location of dedicated wildlife crossings are proposed based on existing land use; existing and proposed infrastructure not associated with the HST Project, previously identified wildlife movement corridors, and consistency with recovery goals for the San Joaquin kit fox. Within the Eastman Lake-Bear Creek Essential Connectivity Area, dedicated wildlife crossings will be spaced at approximately 0.3-mile intervals.

g. The Authority, in collaboration with the Service and CDFG, will develop and implement a monitoring program for use of the dedicated wildlife crossings, and possibly other structures, by San Joaquin kit fox. The final monitoring plan will be reviewed and approved by the Service prior to implementation. The goal of the monitoring program will be to collect data on use of dedicated wildlife crossings by the San Joaquin kit fox, and other wildlife species. The data will also be used to determine the efficacy of the wildlife crossing in facilitating movement of San Joaquin kit fox under the HST and inform future wildlife crossing design alternatives that could be installed in other segments. The monitoring plan will be implemented for no less than five years and may be continued by mutual agreement between the Authority, the Service, and the CDFG.

2. Prior to the start of construction activities, the Service-approved project biologist will conduct pre-construction surveys in accordance with the *San Joaquin Kit Fox Survey Protocol for the Northern Range* (Service 1999c).

3. The Service-approved contractor's biologist will implement the *Standard Measures for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (Service 1999b) to minimize ground disturbance-related impacts on this species.

4. Pre-construction surveys will be conducted between May 1 and September 30 within suitable habitat (i.e., annual grassland, agriculture and barren) to identify potential San Joaquin kit fox dens. Pre-construction surveys will be conducted by a qualified, agency-approved biologist(s) within 30 days prior to the start of construction or construction activities, and will be phased with project build-out.

5. If construction activities within the non-disturbance exclusion zone of active San Joaquin kit fox burrows cannot be avoided during the breeding and pupping season, the Service-approved project biologist will implement measures in accordance with the *Standardized Recommendations for Protection of the San Joaquin kit fox Prior to or During Ground Disturbance* following approval from the Service (Service 1999). Destruction of any known or natal or pupping den will not occur without approval from the Service. A minimum of five days of den-monitoring is required to allow animals to relocate, during which time passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage relocation. After a non-natal den is determined to be unoccupied, it may be excavated under the direction of a Service-approved project biologist following Service approval.

6. All construction pipes, culverts, or similar structures with a diameter of four inches or greater stored at a construction site for one or more overnight periods will be thoroughly inspected for San Joaquin kit fox before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a San Joaquin kit fox is discovered inside a pipe, that section of pipe will not be moved until Service has been consulted. If necessary, and under the direct supervision of the Service-approved biological monitor, the pipe may be moved once to remove it from the path of construction activity, until the San Joaquin kit fox has escaped.

7. If San Joaquin kit fox do not vacate the project action area after five days and passive harassment measures have been implemented, or a San Joaquin kit fox has become accidently trapped within the project action area, the Service-approved biologist will immediately notify the Service.

8. Disturbance to all San Joaquin kit fox dens will be avoided to the maximum extent possible.

9. During the breeding season (December 1 through July 31), all construction activities will be prohibited within the following limits:

    a. A non-natal den exclusion zone of 100 feet will be implemented in areas surrounding occupied/non-occupied non-natal dens.

    b. A natal den exclusion zone of 200 feet will be implemented in areas (or as approved by the Service) surrounding occupied or non-occupied natal dens.

10. Non-exclusion zone fencing will be comprised of ESA high-visibility construction fencing within the limit of direct effects.

11. All construction activities near any occupied dens will cease one-half hour before sunset and will not begin earlier than one-half hour after sunrise.

12. Vacant natal dens may be excavated only between August 15 and November 1 and after pups have vacated the den.

13. As described above under conservation measure 31 above, the Authority will preserve suitable habitat and/or purchase habitat compensation credits at a Service-approved bank to offset direct effects to habitat for the San Joaquin kit fox.

Central California tiger salamander

1. Prior to construction activities, the Service-approved project biologist will conduct a pre-construction survey of potential breeding habitat within the project footprint, and 250 feet of this area. If any central California tiger salamanders are found the Service-approved biologist will immediately notify the Service. Relocation of central California tiger salamanders from within the project action area will only be conducted with Service-approval. The Service-approved project biologist may conduct pit trapping, if necessary, with approval from the Service.

2. The Service-approved contractor's biologist will work in coordination with the Service-approved project biologist when installing amphibian exclusion fencing.

3. The Service-approved contractor's biologist will install exclusion barriers (i.e., silt fences) to exclude central California tiger salamander, and other amphibian or reptile species, from construction areas and to guide breeding adults toward pre-identified mitigation ponds. Exclusion fencing will be maintained by the contractor throughout the central California tiger salamander's entire active period (November to April) or until all construction activities are completed, whichever occurs first. Exclusion fencing must be trenched into the soil at least four inches in depth, with the soil compacted against both sides of the fence for its entire length to prevent amphibians from passing under the fence. Barriers must be inspected by the Service-approved contractor's biologist at least twice weekly on non-consecutive days outside of the breeding season. Barriers will be inspected daily following any rain event, and during months when juvenile central California tiger salamander are most likely emigrating from their breeding ponds in search of burrows in surrounding upland habitat. Barriers will be installed by the contractor with turn-arounds at any access openings needed in the fencing, to redirect amphibians away from openings.

4. The Service-approved project biologist will establish 250-foot non-disturbance exclusion zones around all potential central California tiger salamander breeding habitat that will be avoided; fencing will be comprised of a combination of both ESA high-visibility construction fencing and WEF.

5. Non-disturbance exclusion zones will be maintained and monitored by the Service-approved project biologist or biological monitors to ensure that no take of central California tiger salamander or destruction of suitable habitat occurs outside of the limit of direct effect.

6. Construction activities within 250 feet of central California tiger salamander breeding habitat, while pools are inundated, will be avoided to the extent possible. If construction activities occur within 250 feet of potential central California tiger salamander breeding habitat, which cannot be avoided during the wet season, the following steps will be taken:

    a. Pre-construction wet season surveys will be conducted within potential breeding habitat located in the project action area.

    b. If any life-stage of central California tiger salamanders are found the Service-approved project biologist will immediately contact the Service.

7. As described above under conservation measure 31 above, the Authority will preserve occupied habitat, create/restore suitable habitat, and/or purchase habitat compensation credits at a Service-approved bank in order to offset direct effects to habitat for the central California tiger salamanders.

Vernal pool habitat and invertebrates: conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp

1. The Service-approved project biologist will document compliance with the mitigation measures specific to vernal pool branchiopods, including the results of surveys, seasonal work restrictions and protective measures. These activities will be documented daily during the specific season for sampling, work restrictions, and protective measures when construction takes place.

2. Prior to construction activities, the Service-approved project biologist will conduct pre-construction, reconnaissance surveys in seasonally inundated habitats (seasonal wetland, non-inundated wetlands) within the construction footprint. The Service-approved project biologist will conduct general aquatic surveys at a suitable interval after the first significant storm event of the rainy season (October 15 to June 1), as feasible prior to construction activities. The surveys will include a habitat assessment of the hydrological, biological and ecological conditions of each seasonal wetland and open waters. The habitat assessment will provide information regarding the quality and suitability of seasonal wetlands for conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp. If any vernal pool crustaceans are found during the surveys, the Service-approved project biologist will immediately contact the Service. The Service-approved project biologist will submit a report within one month of completing the field work to the Service-approved project mitigation manager and the Authority. The report will provide results of all surveys, a summary of all the data collected, and the habitat assessment.

3. If any work remains to be completed after October 15, exclusion fencing and erosion control measures will be placed at the vernal pools and other seasonal wetlands as determined by the Service-approved project contractor's biologist. The fencing will provide a buffer between construction activities and the vernal pools and other seasonal

wetlands. The Service-approved project contractor's biologist, under the supervision of the Service-approved project biologist, will erect and maintain the exclusion fencing.

4. As described above under conservation measure 31 above, the Authority will preserve occupied habitat, create/restore suitable habitat, and/or purchase habitat compensation credits at a Service-approved bank in order to offset direct effects to habitat for the conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp.

Valley elderberry longhorn beetle

1. Prior to and during construction activities, the contractor will implement the avoidance and minimization measures detailed in the *Conservation Guidelines for the Valley Elderberry Longhorn Beatle* (Service1999). These measures include establishing and maintaining appropriate buffer areas around elderberry plants, surveying for beetle boreholes in affected shrubs, restricting the use of chemicals that might harm beetles, and restricted mowing within 5 feet of elderberry plants. After construction activities are completed, the Authority will restore any damage to buffer areas containing elderberry shrubs according to specifications within the *Conservation Guidelines for the Valley Elderberry Longhorn Beatle* (Service 1999).

2. In areas where encroachment on the 100-foot buffer has been approved by the Service, the contractor will provide a minimum setback of at least 20 feet from the dripline of each elderberry plant. In buffer areas, construction activities should be minimized, and any damaged area will be restored following construction.

3. The Service-approved project biologist will erect signage every 50 feet along the edge of the avoidance area with the following information: *"This area is habitat of the valley elderberry longhorn beetle, a federally threatened species, and must not be disturbed. This species is protected by the federal ESA of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.*" The signs should be clearly readable from a distance of 20 feet, and must be maintained by the contractor throughout the duration of construction activities.

4. If Valley elderberry longhorn beetle are determined to be present within the project action area the following measures will be implemented:

    a. Dust control procedures, such as regular watering of disturbed soils and soil piles, and covering of soil piles, will be used throughout the construction period.

    b. No insecticides, herbicides, fertilizer, or other chemicals that might harm the beetle or its host plant will be used within the 100-foot non-disturbance zone.

    c. Elderberry shrubs with a diameter of one inch or greater that cannot be avoided during project construction will be transplanted according to the methods outlined in the *ANSI A300 standards for tree care operations* for arboriculture. Shrubs will be transplanted to a Service-approved conservation area during the dormancy period (November 1 to February 15). Each Service-approved conservation area will be a minimum of 1,800 square feet per each transplanted shrub.

5. As described above under conservation measure 31 above, the Authority will preserve occupied habitat, create/restore suitable habitat, and/or purchase habitat compensation credits at a Service-approved bank to offset direct effects to habitat for the valley elderberry longhorn beetle.

Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover

1. For areas of suitable habitat likely to support listed plant species, the Service-approved contractor's biologist will prepare a plan prior to construction activities to address monitoring, salvage, relocation, and propagation of Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover. The plan will be submitted to the Service-approved project biologist for review and approval. The relocation or propagation of these plants and their seed will be performed at a suitable mitigation site, as appropriate per species. Documentation will include provisions that address the techniques, location, and procedures required for the successful establishment of the plant populations. The plan will include provisions for performance that address survivability requirements, maintenance, monitoring, implementation, and the annual reporting requirements. Permit conditions issued by the appropriate resource agencies (e.g., Service, CDFG) will guide the development of the plan and performance standards.

2. Protocol-level, pre-construction botanical surveys for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover will be conducted prior to any construction activities in areas of suitable habitat where permission to enter was not previously granted, time of year precluded full protocol-level botanical surveys, or where the project design changes. Surveys will be conducted in areas of suitable habitat and areas identified as "natural lands."

3. Areas that support Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover that will be temporarily disturbed will be restored to pre-construction conditions. Prior to disturbance, pre-construction conditions will be documented detailing species composition, species richness, percent cover of key species, and photo points will be established. Success criteria for restored areas will be submitted to the Service for review and approval.

4. All directly affected populations of Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover will be documented. Documentation will include the density and percent cover of the species and key habitat

characteristics including soil type, associated species, hydrology, topography, and photo documentation of pre-construction conditions.

5. In the event that Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, or succulent owl's-clover is identified in the project action area through protocol-level botanical pre-construction surveys, the Service will be notified and the Authority will work with the Service to avoid, minimize and potentially compensate for potential direct and indirect effects on the species.

6. As described above under conservation measure 31 above, the Authority will preserve occupied or suitable habitat, create/restore suitable habitat, and/or purchase habitat compensation credits at a Service-approved bank to offset unavoidable direct effects to habitat for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, or succulent owl's-clover.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover in the wild. The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover and the role of the action area in the survival and recovery of the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area includes the CHST-MF area footprint and lands surrounding it. The estimated length of the Merced to Fresno alignment will extend up to 76 miles (Table 4). The area affected by disturbance from noise and vibrations, dust, and lighting during project construction is expected to extend up to 1,000 feet from both sides of the track. Associated project structures, such as roadway improvements, overcrossings, related ancillary facilities, and other permanent project elements, are included in the estimated project action area for the CHST-MF Project. The Merced to Fresno alignment with the Design Option 2 has been identified as the alternative with the largest estimated project action area for a total of 22,643 acres, which will be considered for the purposes of this opinion (Table 4).

Table 4. Total Action Area Estimates for Hybrid Alternative Design Options.

Design Options	Area of Direct Effect* (acres)	Area of Indirect Effect** (acres)	Esimated Project Action Area (acres)
Design Option 1	1,990	17,637	**19,626**
Design Option 2	2,349	20,294	**22,643**

* Includes all roadway improvements, overcrossings, and other related ancillary facilities such as electrical substations and other elements.
** 1,000-foot area of indirect effects on both sides of HST assumed = 2,000 feet total.

Status of the Species

San Joaquin kit fox

For the most recent status of this species please refer to the 5-Year Review published in 2010 (Service 2010).

Central California tiger salamander

Listing Status: On May 23, 2003, we proposed to list the Central California Distinct Population Segment (DPS) of the central California tiger salamander as threatened (Service 2003a). At that time we also proposed reclassification of the Santa Barbara County DPS and Sonoma County DPS from endangered to threatened (Service 2003a). In the same notice we also proposed a special rule under section 4(d) of the Act to exempt take for routine ranching operations for the central California DPS and, if reclassified to threatened, for the Santa Barbara and Sonoma County DPSs (Service 2003b). On August 4, 2004, we determined that the central California DPS of the central California tiger salamander was threatened (Service 2004) and that the Santa Barbara and Sonoma County populations were threatened as well, and reclassified the central California tiger salamander as threatened throughout its range (Service 2004), removing the Santa Barbara and Sonoma County populations as separately listed DPSs (Service 2009a). In the 2004 final rule, we also finalized the special rule to exempt take for routine ranching operations for the central California tiger salamander throughout its range (Service 2004).
On August 18, 2005, as a result of litigation of the August 4, 2004, final rule on the reclassification of the central California tiger salamander DPSs (*Center for Biological Diversity et al. v. United States Fish and Wildlife Service et al.*, C 04-04324 WHA (N.D. Cal. 2005), the District Court of Northern California sustained the portion of the 2004 rule pertaining to listing the central California tiger salamander as threatened with a special rule, but vacated the portion of the 2004 rule that re-classified the Santa Barbara and Sonoma DPSs to threatened status thereby reinstating their status as endangered. On August 31, 2011, the List of Endangered and Threatened Wildlife in part 17, subchapter B of Chapter I, title 50 of the Code of Federal Regulations (CFR) was amended to reflect the vacatures contained in the 2005 court order, classifying the Santa Barbara DPS and the Sonoma DPS of the central California tiger

salamander as endangered, and the Central DPS of the central California tiger salamander as threatened with a special rule to exempt routine ranching operations from take (Service 2005b and 2011a).

Description: The central California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 8.2 inches (Petranka 1998). Tiger salamanders exhibit sexual dimorphism; males tend to be larger than females. The coloration of the central California tiger salamander is white or yellowish markings against black. As adults, central California tiger salamanders tend to have the creamy yellow to white spotting on the sides with much less on the dorsal surface of the animal, whereas other tiger salamander species have brighter yellow spotting that is heaviest on the dorsal surface. The larvae have yellowish gray bodies, broad fat heads, large feathery external gills, and broad dorsal fins extending well up their back and range in length from approximately 0.45 to 0.56 inches (1.14 to 1.42 centimeters) (Petranka 1998).

Distribution: Historically, the central California tiger salamander inhabited low elevation grassland and oak savanna plant communities of the Central Valley, and adjacent foothills, and the inner coast ranges in California (Jennings and Hayes 1994; Storer 1925; Shaffer *et al.* 1993). The species has been recorded from near sea level to approximately 3,900 feet (1188.7 meters) in the coast ranges and to approximately 1,600 feet (487.7 meters) in the Sierra Nevada foothills (Shaffer et al. 2004). Along the coast ranges, the species occurred from the Santa Rosa area of Sonoma County, south to the vicinity of Buellton in Santa Barbara County. The historic distribution in the Central Valley and surrounding foothills included northern Yolo County southward to northwestern Kern County and northern Tulare County.

The central California tiger salamander occupies the Bay Area (central and southern Alameda, Santa Clara, western Stanislaus, western Merced, and the majority of San Benito counties), Central Valley (Yolo, Sacramento, Solano, eastern Contra Costa, northeastern Alameda, San Joaquin, Stanislaus, Merced, and northwestern Madera counties), southern San Joaquin Valley (portions of Madera, central Fresno, and northern Tulare and Kings Counties), and the Central Coast Range (southern Santa Cruz, Monterey, northern San Luis Obispo, and portions of western San Benito, Fresno, and Kern counties).

Status and Natural History: The central California tiger salamander has an obligate biphasic life cycle (Shaffer *et al.* 2004). Although the larvae salamanders develop in the vernal pools and ponds in which they were born, they are otherwise terrestrial salamanders and spend most of their postmetamorphic lives in widely dispersed underground retreats (Shaffer *et al.* 2004; Trenham *et al.* 2001). Subadult and adult central California tiger salamanders spend the dry summer and fall months of the year in the burrows of small mammals, such as California ground squirrels (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Because they spend most of their lives underground, central California tiger salamanders are rarely encountered, even in areas where they are abundant.

Central California tiger salamanders may also use landscape features such as leaf litter or desiccation cracks in the soil for upland refugia. Burrows often harbor camel crickets and other invertebrates that provide likely prey for central California tiger salamanders. Underground refugia also provide protection from the sun and wind associated with the dry California climate that can cause excessive drying of amphibian skin. Although central California tiger salamanders are members of a family of "burrowing" salamanders, they are not known to create their own burrows. This may be due to the hardness of soils in the California ecosystems in which they are found. Tiger salamanders typically use the burrows of ground squirrels and gophers (Loredo *et al.* 1996; Trenham 1998a). However, pocket gopher burrows are most often used by Sonoma central California tiger salamanders in Sonoma County (D. Cook, pers. comm., 2001). Central California tiger salamanders depend on persistent small mammal activity to create, maintain, and sustain sufficient underground refugia. Burrows are short lived without continued small mammal activity and typically collapse within approximately 18 months (Loredo *et al.* 1996).

Upland burrows inhabited by central California tiger salamanders have often been referred to as "estivation" sites. However, "estivation" implies a state of inactivity, while most evidence suggests that central California tiger salamanders remain active in their underground dwellings. A recent study has found that central California tiger salamanders move, feed, and remain active in their burrows (Van Hattem 2004). Because central California tiger salamanders arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving, researchers have long inferred that central California tiger salamanders are feeding while underground. Recent direct observations have confirmed this (Trenham 2001; van Hattem 2004). Thus, "upland habitat" is a more accurate description of the terrestrial areas used by central California tiger salamanders.

Once fall or winter rains begin, the salamanders emerge from the upland sites on rainy nights to feed and to migrate to the breeding ponds (Shaffer et al. 1993; Stebbins 1989, 2003). Adult salamanders mate in the breeding ponds, after which the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Historically, the central California tiger salamander utilized vernal pools, but the animals also currently breed in livestock stockponds. Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer 1925; Twitty 1941). In ponds with no or limited vegetation, they may be attached to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). After breeding, adults leave the pool and return to the small mammal burrows (Loredo et al. 1996; Trenham 1998a), although they may continue to come out nightly for approximately the next two weeks to feed (Shaffer et al. 1993). In drought years, the seasonal pools may not form and the adults cannot breed (Barry and Shaffer 1994).

Central California tiger salamander larvae typically hatch within 10 to 24 days after eggs are laid (Storer 1925). The peak emergence of these metamorphs is typically between mid-June to mid-July (Loredo and Van Vuren 1996; Trenham et al. 2000) but in some areas as early as late February or early March. The larvae are totally aquatic. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson 1968). Larger larvae have been known to consume the pool tadpoles of Pacific treefrogs (*Pseudacris regilla*), Western spadefoot toads (*Spea hammondii*), and California red-legged frogs (*Rana draytonii*) (J. Anderson 1968; P. Anderson 1968). Central California tiger salamander larvae are among the top aquatic predators in seasonal pool ecosystems. When not feeding, they often rest on the bottom in shallow water but are also found throughout the water column in deeper water. Young salamanders are wary and typically escape into vegetation at the bottom of the pool when approached by potential predators (Storer 1925).

The larval stage of the central California tiger salamander usually last three to six months, as most seasonal ponds and pools dry up during the summer (Petranka 1998). Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins 1973). Individuals collected near Stockton in the Central Valley during April varied from 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left the breeding pools 60 to 94 days after the eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. The longer the ponding duration, the larger the larvae and metamorphosed juveniles are able to grow, and the more likely they are to survive and reproduce (Pechmann *et al.* 1989; Semlitsch *et al.* 1988; Morey 1998; Trenham 1998b). The larvae will perish if a site dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1989) found a strong positive correlation with ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 pools sampled supported larval central California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only six (20 percent) provided suitable conditions for successful reproduction that year.

Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch *et al.* 1988; Scott 1994; Morey 1998). In the late spring or early summer, before the ponds dry completely, metamorphosed juveniles leave them and enter upland habitat. This emigration occurs in both wet and dry conditions (Loredo and Van Vuren 1996; Loredo *et al.* 1996). Unlike during their winter migration, the wet conditions that central California tiger salamanders prefer do not generally occur during the months when their breeding ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under these conditions, they may move only short distances to find temporary upland sites for the dry summer months, waiting until the next winter's rains to move further into suitable upland refugia. Once juvenile central California tiger salamanders leave their birth ponds for upland refugia, they typically do not return to ponds to breed for an average of 4 to 5 years. However, they remain active in the uplands, coming to the surface during rainfall events to disperse or forage (Trenham and Shaffer, 2005).

Threats: Documented or potential central California tiger salamanders predators include coyotes, raccoons, striped skunks, opossums, egrets, great blue herons, crows, ravens, garter snakes, bullfrogs, California red-legged frogs, mosquito fish, and crayfish.

The central California tiger salamander is imperiled throughout its range due to a variety of human activities (Service 2004). Current factors associated with declining central California tiger salamander populations include continued habitat loss and degradation due to agriculture and urbanization; hybridization with the non-native eastern salamander (Fitzpatrick and Shaffer

2004; Riley *et al.* 2003); and predation by introduced species. Central California tiger salamander populations are likely threatened by multiple factors but continued habitat fragmentation and colonization of non-native salamanders may represent the most significant current threats. Habitat isolation and fragmentation within many watersheds have precluded dispersal between sub-populations. Other threats include predation and competition from introduced exotic species; possible commercial over-utilization; diseases; various chemical contaminants; road kill; and certain mosquito and rodent control operations. Currently, these various primary and secondary threats are largely not being offset by existing Federal, State, or local regulatory mechanisms. The central California tiger salamander is also prone to chance environmental or demographic events to which small populations are particularly vulnerable.

The Bay Area is located within the Central Coast and Livermore vernal pool regions (Keeler-Wolf *et al.* 1998). Vernal pools within the Coast Range are more sporadically distributed than vernal pools in the Central Valley (Holland 2003). This rate of loss suggests that vernal pools in these counties are disappearing faster than previously reported (Holland 2003). Most of the vernal pools in the Livermore Region in Alameda County have been destroyed or degraded by urban development, agriculture, water diversions, poor water quality, and long-term overgrazing (Keeler-Wolf *et al.* 1998). During the 1980s and 1990s, vernal pools were lost at a 1.1 percent annual rate in Alameda County (Holland 1998).

Due to the extensive losses of vernal pool complexes and their limited distribution in the Bay Area region, many central California tiger salamander breeding sites consist of artificial water bodies. Overall, 89 percent (124) of the identified water bodies are stock, farm, or berm ponds used by cattle grazing and/or as a temporary water source for small farm irrigation (CDFG 2011). This places the central California tiger salamander at great risk of hybridization with non-native tiger salamanders, especially in Santa Clara and San Benito counties. Without long-term maintenance, the longevity of artificial breeding habitats is uncertain relative to naturally occurring vernal pools that are dependent on the continuation of seasonal weather patterns (Shaffer in litt. 2003).

Shaffer *et al.* (1993) found that the East Bay counties of Alameda and Contra Costa supported the greatest concentrations of central California tiger salamander. Central California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins 2003). Central California tiger salamanders are under increasing pressure from habitat conversion and urbanization, development (i.e. Dublin Ranch, Fallon Village, Fallon Sports Park, Staples Ranch, and Shea Center Livermore), and infrastructure, utility and safety improvement projects (i.e. I-580 Eastbound HOV, I-580/Isabel Avenue Interchange, and I-580/Charro Avenue Interchange). The species' low recruitment and high juvenile mortality makes it particularly susceptible to habitat loss, fragmentation, urbanization, and construction related harm and mortality. Most of the central California tiger salamander natural historic habitat (vernal pool grasslands) available in this region has been lost due to urbanization and conversion to intensive agriculture (Keeler-Wolf *et al.* 1998). Central California tiger salamanders are now primarily restricted to artificial breeding ponds, such as bermed ponds or stock ponds, which are typically located at higher elevations (CDFG 2011).

Conservancy fairy shrimp

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007a).

Vernal pool fairy shrimp

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007b).

Vernal pool tadpole shrimp

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007c).

Valley elderberry longhorn beetle

For the most recent status of this species please refer to the 5-Year Review published in 2006 (Service 2006a).

Colusa grass

For the most recent status of this species please refer to the 5-Year Review published in 2008 (Service 2008).

San Joaquin Valley Orcutt grass

Listing Status: San Joaquin Valley Orcutt grass was federally listed as threatened on March 26, 1997. It was listed by the State of California as endangered in 1979 (Service 1997) and is on the California Native Plant Society's List 1B. Critical habitat was first designated for the San Joaquin Valley Orcutt grass 2003, revised in 2005, with the final designation established in 2006 (Service 2003c, 2005b, and 2006b).

Description: San Joaquin Valley Orcutt grass is a narrowly distributed annual of the grass family Poaceae, subfamily *Chloridoideae*, in the tribe *Orcuttieae*. San Joaquin Valley Orcutt grass was presumed to be the only member of the *Orcuttieae* tribe that was entirely endemic to the San Joaquin Valley (Stone et al. 1988), and is therefore commonly referred to as San Joaquin Valley Orcutt grass. In consideration of the genus, Stone also mentions that assessment-of the historical range of *Orcuttieae* species in the Central Valley is complicated by the fact that widespread agricultural development preceded study of these grasses. However, with the exception of a single population in Solano County, the historical range of San Joaquin Valley Orcutt grass believed to be the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare Counties (Keeler-Wolf et al. 1998; Service 2005c). Grasses in the tribe have pith-filled stems, lack distinct leaf sheaths and ligules, and produce a sweet-smelling exudate (Stone et al. 1988). San Joaquin Valley Orcutt grass typically grows in tufts comprised of several spreading to erect stems about 5 to 15 centimeters (2 to 6 inches) tall and has two distinguishing morphological features; the obvious capitate inflorescence and the middle of five lemma teeth is conspicuously elongated.

Like all plants in the *Orcuttieae* tribe, San Joaquin Valley Orcutt grass is a highly specialized C_4 plant (an evolutionary adaptation that facilitates photosynthetic productivity in arid and semi-arid climates), that is dependent on vernal pools for survival. San Joaquin Valley Orcutt grass is specifically endemic to deep vernal pools, requiring inundated soils for at least part of the year for seed germination, seed bank storage, and its juvenile aquatic growth stage (Stone et al. 1988). Consequently, San Joaquin Valley Orcutt grass seldom becomes established above the high water mark where Orcuttia species are competitively excluded (Keeley 1998), and forms distinct emergent ring-patterns below the high water mark (Stebbins et al. 1996). Plants emerge underwater, forming a basal rosette of juvenile leaves that are maintained for roughly three months (Keeley 1998). As water temperatures increase, floating leaves form and remain until standing water has evaporated, at which point terrestrial leaves are formed. Flowering begins within a few days after the pool has dried and typically peaks in mid-June, but may be extended into August or September depending on growth conditions (Griggs 1980). These growth phases, as well as C_4 photosynthetic anatomy, are adaptive features that promote the dominance of San Joaquin Valley Orcutt grass in vernal pool environments for a month or more after the pools have dried (Keeley 1998).

From phylogenetic analysis, Keeley (1998) reported that the absence of a ligule—the membranous tooth- or hair-like projection between the leaf sheath and blade common to many grass taxa—separated *Orcuttia* and *Tuctoria* into sister groups of *Neostapfia*. *Orcuttia* species can be separated from *Tuctoria* by the presence of certain aquatic features, including the presence of floating leaves.

Rice and Emery (2003) reported that the relatively isolated character of vernal pool habitats likely restricts gene flow between species populations. Similarly, Griggs (1980) specified that gene flow among populations of San Joaquin Valley Orcutt grass is likely non-existent. Thus, fertilization is typically restricted to individuals within a given pool and out-crossing among pools is infrequent. High genetic diversity was observed among San Joaquin Valley Orcutt grass plants grown from the same seed collection source (Griggs (1980).

The flowering pattern observed among *Orcuttia* (as well as in *Tuctoria*) species may promote and maintain genetic variation among successive generation. San Joaquin Valley Orcutt grass is wind-pollinated and generally flowers from April to September (Griggs and Jain 1983; Vollmar 2002). The first two flowers on plants of these species open simultaneously and do not produce pollen until the ovaries are no longer receptive. Thus, fertilization for these flowers is solely a result of outcrossing from different plants.

Distribution: San Joaquin Valley Orcutt grass is presumed to be the only member of the *Orcuttieae* tribe that is entirely endemic to the San Joaquin Valley (Stone et al. 1988. The historic range of *Orcuttieae* species in the Central Valley is complicated by the widespread agricultural development, which preceded study of these grasses. However, with the exception of a single putative population in Solano County, the historical range of San Joaquin Valley Orcutt grass believed to be the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare Counties (Keeler-Wolf et al. 1998; Service 2005).

Annual precipitation affects both seed production and seed germination. Vollmar (2002) reported that seed production by San Joaquin Valley Orcutt grass is largely dependent upon annual precipitation and can vary two- to three-fold among years. Population estimates are further confounded by seed germination, which requires long periods of inundation, and can vary considerably among years depending upon annual precipitation and associated water depth and duration in vernal pools. Thus, variability in annual precipitation affects the accuracy and predictability of population estimates and trends. Since listing, infrequent site visits and large inter-annual fluctuations in populations have prohibited the projection of current population trends.

There are 53 occurrences of San Joaquin Valley Orcutt grass reported in the CNDDB. Of these 53 occurrences, 17 are known to be extirpated, 3 are presumed extirpated, and 33 are presumed extant. The primary concentration of extant occurrences is discontinuously distributed across an 80-kilometer (50-mile) range from east-central Merced County to the northern boundary of Fresno County. Outside of Merced and Fresno Counties, there is a single extant occurrence in central Solano County, and one in northern Tulare County. The historical range of San Joaquin Valley Orcutt grass is reported to be from its northern extent in east-central Stanislaus County to its southern extent in northern Tulare County (CNDDB 2012). Current evidence indicates that San Joaquin Valley Orcutt grass had been extirpated from all Stanislaus County localities, and is present at only one of the two historical localities in Tulare County. Thus, with the addition of the Solano County occurrence the current range of San Joaquin Valley Orcutt grass includes portions of Solano, Merced, Madera, Fresno, and Tulare Counties.

Eastern Merced County supports the highest concentration of extant localities of San Joaquin Valley Orcutt grass (22 of 33 occurrences or 67 percent; CNDDB 2012). However, the number of individuals present may vary considerably from one locality to the next. For example, one occurrence in this area was reported to support less than 10,000 individuals in 1981, while another occurrence consisted of only a single plant in 1987 (CNDDB 2012). The Lanes Bridge area of Madera and Fresno counties supports seven (21 percent) of the presumed extant occurrences of San Joaquin Valley Orcutt grass. This is the second-highest concentration of San Joaquin Valley Orcutt grass outside of eastern Merced County. Conversely, all seven historical occurrences from Stanislaus County, as well as an additional ten occurrences from Merced (5), Madera (2), and Fresno (3) Counties have been eliminated. Three other occurrences from Merced, Madera and Tulare Counties are categorized as possibly extirpated (CNDDB 2012).

Status and Natural History: San Joaquin Valley Orcutt grass typically occurs within land forms such as remnant alluvial fans and stream terraces, as well as tabletop lava flows (Stone et al. 1988; Stebbins et al. 1995). The predominant physiographic and edaphic settings for this species include: (1) high-terrace sites with soils of the Redding and related series; (2) lower terrace sites of the San Joaquin and related series, also with an iron-silica hardpan but less strongly acid; and

(3) sites with shallow, residual soils of the Pentz and related series, underlain by well-cemented tuffaceous alluvium (Ulrich and Stromberg 1962; Arkley 1962a, 1964; Huntington 1971; Stephens 1982). Sawyer and Keeler-Wolf (1995) reported San Joaquin Valley Orcutt grass in Northern Claypan, Northern Hardpan, and Northern Basalt Flow vernal pool types. Research has speculated that some members of the *Orcuttieae* tribe have specific geologic affinities. Vollmar (2002) reported that San Joaquin Valley Orcutt grass populations occur on Riverbank, North Merced Gravels, and Mehrten geologic surfaces, which could relate to the tendency of these surfaces to support larger pools, noting that soil characteristics may also play a role.

Vollmar (2002) termed San Joaquin Valley Orcutt grass as a vernal pool "specialist" that has an affinity for large, deep vernal pools. Its occurrence is restricted to a narrow band of undulating topography at the base of the Sierra foothills, ranging from 30 to 755 meters (100 to 2475 feet) elevation above mean sea level (Stebbins et al. 1995). Stone et al. (1998) reported that San Joaquin Valley Orcutt grass was found in vernal pools ranging in size from 0.14 hectares (0.04 acre) to 4.9 hectares (12.11 acres). Most occurrences were documented in pools that were approximately one acre or greater in size (Vollmar, J., pers. comm., (2007). It has been further speculated that San Joaquin Valley Orcutt grass is associated with pools that exhibit pronounced soil surface cracking (Stebbins et al. 1996).

The current status of many presumed extant populations has not been reassessed, and areas of potential occurrences remain to be surveyed. Thus, reliable estimates regarding the amount and distribution of suitable habitat, such as large or deep pools that exhibit extensive periods of inundation with pronounced soil surface cracking, is currently unknown.

Threats: Habitat for the San Joaquin Valley Orcutt grass has been been lost and fragmented throughout its historical range (Service 1997). The primary causes attributed to the reduction and fragmentation of habitat are agricultural land conversion, urbanization, hydrologic modifications and small population size. According to Stone et al (1988), all historical populations that existed in Stanislaus County had been extirpated by 1986-1987. CNDDB data, dating back to 1981, reveals no observations for Stanislaus County. Stone et al. (1988) noted "Habitat Eliminated" for all eight extirpations listed in his report. Vernal pool data from Holland (1978) projected that 12 historical localities had been eliminated from Madera and Fresno Counties. Therefore, it is estimated that at least 45 percent of known and projected pre-agricultural sites were eliminated before 1988. The principal cause of this pre-listing loss is widely accepted to be the elimination of habitat due to the expansion of agriculture (Stone et al. 1988, CNDDB 2012).

The vast majority of land on the Central Valley floor has potential for urbanization and agricultural conversion due to flat topography, and its vicinity to existing infrastructure. Twenty-four (72 percent) of the 33 extant localities of San Joaquin Valley Orcutt grass occur on private land. Twelve are currently excluded from land conversion, eight are protected by existing conservation easements through the Nature Conservancy, and four occur on State or federally administered public lands. An additional three occurrences, located on Ichord Ranch, are located on lands that have been proposed for conservation easements. The remaining 17 (56 percent) extant occurrences have potential to be adversely affected by land use conversion.

As previously described, San Joaquin Valley Orcutt grass occurs under a variety of edaphic and geologic conditions. Consequently, each habitat type exhibits various potential for land conversion. All 13 sites located on lower terrace soils were extirpated prior to listing, presumably because these soil types are relatively fertile and therefore more suitable to intensive agriculture (Stone et al. 1988). These occurrences include five in Stanislaus County, four in Madera County, three in Merced County, and one in Fresno County. Four other localities were also been eliminated prior to listing, due to indirect effects of agricultural conversion. These include hydrologic modifications, which likely eliminated two occurrences in Merced County and one Fresno County (Stone et al. 1988), and irrigated runoff which likely caused the elimination of one occurrence in Madera County (Service 2005).

One occurrence in Merced County, threatened by development proposed by the University of California, Merced campus, was preserved through modification of the southeast boundary of the campus prior to construction (Murray *in litt.* 2011). The habitat is now part of the proposed Campus Vernal Pool Reserve, owned by the University of California. Additional habitat has been preserved in the Cyril Smith Trust, owned by the Nature Conservancy (UC Merced 2009). The last known extant San Joaquin Valley Orcutt grass occurrence in Tulare County, which is located on the Stone Corral Ecological Reserve, may have been eliminated due to recent establishment of orchards and large dairies on adjacent properties (A. Ferranti, pers. comm., 2007). It is suspected that these land use changes may have affected the hydrology of the supporting vernal pool. San Joaquin Valley Orcutt grass was confirmed at the site in 2006, but was not observed in 2007. However, absence of this species during 2007 surveys may be attributable to below-normal precipitation rather than hydrologic changes (A. Ferranti, pers. comm. 2007).

Small numbers of individual San Joaquin Valley Orcutt grass plants located in Madera County are supported in a vernal pool complex owned by California Department of Transportation. These occurrences are located adjacent to State Route Highway 41, roughly 10 kilometers (6 miles) north of Fresno. This section of highway is proposed for realignment. However, current plans for highway improvements are to re-route the highway east of the vernal pool complex which supports San Joaquin Valley Orcutt grass and a multitude of other California State and federally listed species (Von Berg 2005). Thus, it is anticipated that the proposed Highway 41 expansion project may not adversely affect this San Joaquin Valley Orcutt grass occurrence.

The life cycle of San Joaquin Valley Orcutt grass is intrinsically linked to vernal pool hydrology (Service 2005). Seed germination, juvenile aquatic stage, reduced competition by upland and exotic species, timing of flowering, and seed production are determined by the timing and duration of the inundation period, as well as available soil moisture throughout the growing season. Thus, any changes to the hydrologic regime of the pools and/or source areas (watersheds), that effectively alter the timing, depth, or period of pool inundation will likely affect the stability of San Joaquin Valley Orcutt grass populations. Common human activities that may result in changes to the water retention capacity of soils and substrates, such as altering landscape topography through urbanization, surface compaction, land use conversion, flood control, stream channelization, gravel and aggregate mining, deep plowing, or the addition of soil amendments may significantly alter hydrologic regimes.

Alteration of hydrology from human activities have both benefited and negatively affected San Joaquin Valley Orcutt grass populations. Increases in water depth or length of pool inundation period, as it is endemic to deep water pools may benefit San Joaquin Valley Orcutt grass (Stone et al. 1988). Vollmar (pers. comm. 2007) observed that depth of water and the period of inundation in some vernal pools may be increased as a result of road development and associated changes in topography. Conversely, the hydrologic regime for a population within a playa pool located at the base of the spillway for Burns Creek dam in Merced County was altered such that the marginal depth and inundation period is marginal for supporting the continued existence of this occurrence. Stone et al. (1988) reported another population located adjacent to a railroad grade in Merced County that was extirpated due to hydrologic alterations, which resulted from changes in culvert size under the grade.

The effects of grazing on vernal pool plants are largely site-specific, and dependent upon a variety of factors including frequency, intensity, timing, duration of grazing, livestock species, and the life-stage of affected plants (i.e., emergent, vegetative, seeding, etc.) (Stone et al.1988). Information provided by Stone et al. (1988) and CNDDB (2007) suggests that roughly 70 percent of extant populations of San Joaquin Valley Orcutt grass have the potential to be adversely affected by improper grazing. Direct effects of improper grazing regimes may result in removal of above ground biomass (including inflorescences and seeds), compaction and soil disturbance, and facilitation of invasive weed species. The Table Mountain occurrence in Fresno County, which is partially protected and administered by the Bureau of Land Management, may be subjected to trespass grazing (D. Kearns, pers. comm. 2007).

Previous studies, surveys, and anecdotal sources, have described grazing as a threat to the San Joaquin Valley Orcutt grass. However, there is disagreement regarding whether grazing actually poses a threat to this species. Research by Marty (2004 and 2005) suggests that livestock grazing plays an important role in maintaining species diversity in vernal pool grasslands through control of invasive species. In some instances vernal pool vegetation, including San Joaquin Valley Orcutt grass is actively managed through seasonal grazing by cattle (S. Foreman, pers. comm., 2010). Direct effects of grazing pressure on San Joaquin Valley Orcutt grass in the winter and early spring may be limited because the majority of plants have not emerged or are in the aquatic growth stage of the lifecycle. Nonetheless, improper grazing regimes that result in overgrazing of San Joaquin Valley Orcutt grass plants may pose a threat to extant populations. Soil disturbance from overgrazing by cattle may adversely affect San Joaquin Valley Orcutt grass indirectly by facilitating invasive plant species (Stone et al. 1988). Invasive species that have been reported to invade vernal pool habitat include Mediterranean barley, hood canary grass, annual rabbitsfoot grass, Italian ryegrass, and alkali mallow (Stone et al. 1988). Soil disturbance by cattle grazing, combined with competition by the first four invasive species listed above, threatens two San Joaquin Valley Orcutt grass occurrences, and alkali mallow appears to be a threat to an occurrence at another heavily grazed site (Stone et al. 1988).

Grasshoppers have been observed on San Joaquin Valley Orcutt grass plants at two localities. However, San Joaquin Valley Orcutt grass appears to be only slightly susceptible to grasshopper predation. This characteristic has been attributed to the viscid-aromatic exudate produced by *Orcuttia* species, which may act as an effective deterrent to grasshoppers (Stone et al. 1988).

San Joaquin Valley Orcutt grass occurrences on private lands may be threatened by off-road vehicle use. In addition, repeated vehicle use of undeveloped roads and trails in vernal pool habitat may result in compacted surface soils which can affect pool hydrology. According to CNDDB (2012), damage from off-road vehicle use is listed as a threat to two San Joaquin Valley Orcutt grass occurrences.

Annual precipitation may affect both seed production and seed germination. Therefore the number of individuals comprising a given population of San Joaquin Valley Orcutt grass can vary widely from year to year. In fact, some extant localities do not appear during dry years and appear the next year, under more favorable rainfall conditions, with plants numbering in the thousands (Stone *et al.* 1988). Small populations may be extremely vulnerable to extinction (Shaffer 1981, 1987; Primack 2006; Groom et al. 2006). In particular, small population size makes it difficult for this species to persist while sustaining effects from competition with non-native plant species, intensive grazing, drought, minimally grasshopper predation, and other unknown factors. Small populations may be highly susceptible to extirpation due to stochastic events, inbreeding depression, or other environmental disturbances (Gilpin and Soule 1988; Goodman 1987). Populations that decline to zero individuals during a growing season may not always be capable of rebounding from the soil seed bank and become extirpated (Service 2005). Small population size is noted as a concern for CNDDB occurrence #'s 48, 49, 50, 53, 56 and 62 (CNDDB 2012).

Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, IPCC 2007). Average annual temperature increases have been reported. The effects of increased winter flooding and drought conditions in the spring and summer have the potential to adversely affect the stability of San Joaquin Valley Orcutt grass populations, and alter availability of suitable deep water vernal pool habitat. For populations existing within marginal habitat, minor environmental changes may result in higher rates of mortality in the short-term. Long-term effects for all San Joaquin Valley Orcutt grass populations may include decreased reproductive output and survivorship, and reduced population density and stability. Species restricted to a specific location by the lack of suitable dispersal habitat or stationary species, such as the San Joaquin Valley Orcutt grass, may be more susceptible to these long-term effects (Schwartz et al. 2001).

Vernal pools are highly specialized ecosystems, and represent a unique combination of geology, climate, and slope (Vollmar 2002). Moreover, seasonal extremes of inundation and subsequent drought promote a unique abiotic environment that facilitates the persistence of highly adapted native plant communities. These environmental conditions are the result of riverine terrace formation processes that developed across extensive geological time-scales. Holland (1978) estimated that roughly 90 percent of the Central Valley's vernal pools have been eliminated, primarily through agricultural and urban development. Further habitat elimination, through climate-induced changes in hydrology or by land use conversion, likely represents irreparable habitat loss, which can only be partially simulated through intensive vernal pool re-creation efforts.

San Joaquin Valley Orcutt grass is a highly specialized plant species is a strict endemic of San Joaquin Valley vernal pool habitats (with the exception of the Solano County population) that are deep and typically greater than 0.4 hectare (1 acre) in size. As previously described, many factors underlying the occurrence and persistence of San Joaquin Valley Orcutt grass are dependent upon site hydrology, including: seed germination, juvenile aquatic stage, reduced competition by upland and exotic species, timing of flowering, and seed production. The principal components of the hydrologic regime tied to the persistence of this species appear to be dependent upon the timing and duration of the inundation period and availability of soil moisture during the growing season.

Hairy Orcutt grass

For the most recent status of this species please refer to the 5-Year Review published in 2009 (Service 2009b).

Greene's tuctoria

For the most recent status of this species please refer to the 5-Year Review published in 2007 (Service 2007d).

Succulent owl's-clover

For the most recent status of this species please refer to the 5-Year Review published in 2011 (Service 2011b).

Environmental Baseline

Geography, topography, and climate

The Merced to Fresno Section is located within the San Joaquin Valley, which is the southern half of the Great Valley ecological subregion. The San Joaquin Valley trends northwest from the Tulare Basin at the southern end to the Sacramento–San Joaquin Delta at the northern end. The eastern edge of the valley meets the western slope of the Sierra Nevada, and the western edge of the valley meets the eastern slope of the Temblor and Diablo ranges that together constitute the southern interior Coast Range ecoregion. Elevations above mean sea level in the Action Area range from 160 feet near Downtown Merced to 300 feet north of Downtown Fresno. The topography throughout the project action area is generally flat with slopes ranging from 0 percent to 2 percent. Drainage generally flows to the west and southwest.

The San Joaquin Valley has an arid to semi-arid climate. Summers are generally hot and dry, whereas winters are cool and wet. Mean annual temperatures range from a low of 36 degrees Fahrenheit (°F) in December to a high of 98°F in July (Western Region Climate Center (WRCC) 2010). The growing season (defined as a 50 percent probability of temperatures at or above 32°F) ranges from 261 days (March 3 to November 19) for Merced to 300 days (February 5 to December 1) for Fresno (Natural Resources Conservation Service 2002). Average annual precipitation is approximately 12.5 inches in the northern part of the project action area near Merced, and approximately 11.0 inches in the southern part of the project action area near Fresno (WRCC 2010). Approximately 80 percent of the annual rainfall in the project action area occurs between November and March.

The project action area lies within the southern portion of the San Joaquin River Basin, which extends from the Sacramento-San Joaquin Delta in the north to the northerly boundary of the Tulare Lake Basin in the south, and from the crest of the Sierra Nevada Range in the east to the crest of the Coast Ranges in the west. The basin encompasses approximately 13,500 square miles and includes large areas of high elevation along the western slope of the Sierra Nevada. As a result, the San Joaquin River experiences significant snowmelt runoff during the late spring and early summer. Flood flows typically occur between April and June.

The Merced to Fresno Section is located in three watershed sub-basins: the Middle San Joaquin–Lower Chowchilla, Fresno River, and Upper Dry. Most of the project action area is located to the north of the San Joaquin River in the Middle San Joaquin–Lower Chowchilla Watershed. The portion of the project action area to the south of the San Joaquin River is located in the Tulare-Buena Vista Lakes Watershed. Prominent water features in the project action area include Bear Creek, Miles Creek, Owens Creek, Duck Slough, Deadman Creek, Dutchman Creek, the Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Dry Creek, the Fresno River, Cottonwood Creek, and the San Joaquin River. The natural hydrology of the region has been significantly altered through the construction of dams, storage reservoirs, diversion dams, canals, and groundwater pumping associated primarily with agricultural irrigation.

Land use

Agricultural lands account for approximately 75 percent of the land use within the project action area. Orchards, vineyards, fallow fields, row crops and field crops constitute 66 percent, while dairies, pastures, and inactive agriculture constitute an additional 10 percent. Urban areas, including large cities such as Merced and Fresno and several smaller cities between, constitute the second greatest land use within the project action area.

Noise environment

The current existing noise environment in the project action area is influenced by Highway 99, UPRR and BNSF railroad traffic, local community noise, and local roadway traffic. The lowest measured decibels (dBA) was 46 and the peak measured dBA was 75 (e.g. operating a lawnmower at 50 feet). The typical measured dBA was in the mid-sixties (e.g. sound produced by an air conditioner unit at 50 feet) (Authority and FRA 2012a; page 3.4-4). At the northern end of the alignment in Atwater, passenger and freight trains dominate the noise exposure in areas close to the UPRR and BNSF tracks. In areas within close proximity to Santa Fe Avenue, local roadway traffic dominates the noise environment. Nearing Merced from the north, traffic on Highway 99 and freight trains on the UPRR railroad dominate the noise exposure, with roadway traffic contributing more noise near the city center where Highway 99, SR 59, and SR 140 converge. (Authority and FRA 2012a; page 3.4-25).

South of Merced, noise from Highway 99 and UPRR dominate the noise environment in unincorporated areas between Merced and Chowchilla. South of Chowchilla, noise from Highway 99 and UPRR dominates the existing noise environment at scattered residences. Upon entering Madera, the HST alignment moves farther from Highway 99, and the noise environment near Madera's city center is dominated by UPRR traffic and local community noise. The Madera Municipal Airport contributes aircraft noise to the environment (Authority and FRA 2012a; page 3.4-25).

In the unincorporated area between Madera and Fresno, SR 99 and UPRR traffic dominate the noise environment. Entering Fresno, the noise environment is dominated by freight trains and local roadway traffic. The UPRR runs through Fresno east of SR 99, and the UPRR rail yard is located between Ashlan Avenue and Clinton Avenue. In this area, the rail yard contributes to the noise environment along with Highway 99 and local community noise. South of the rail yard, the noise environment is dominated by UPRR traffic and local community noise. (Authority and FRA 2012a; page 3.4-25)

Fresno is the most densely populated city within the proposed MF alignment, with several highways, busy local roads, UPRR, and aircraft noise contributing to the noise environment. Highway 99, Highway 180, and Highway 41 are all near the proposed HST station site in Fresno. Aircraft noise from three local airports adds to the existing noise environment in the Fresno area. (Authority and FRA 2012a, page 3.4-25).

San Joaquin kit fox

The entire project action area occurs within the known geographic and historic range range of the San Joaquin kit fox (Grinnell et al. 1937; Service 1998 and 2010; CNDDB 2012). The San Joaquin kit fox in Merced, Madera, and Fresno Counties exists among several extremely small fragmented populations that may be at or below the extinction threshold for this species (Service 2010; B. Cypher, pers. comm., 2012; CNDDB 2012). Grinnell et al. (1937) identified three subspecies of San Joaquin kit fox based on morphological characteristics: *Vulpes macrotis mutica, Vulpes macrotis arsipus*, and *Vulpes macrotis macrotis*. They included this region (Merced, Madera, and Fresno Counties) within the historic range of the San Joaquin kit fox (*Vulpes macrotis mutica*) and (Grinnell et al. 1937; Authority and FRA 2012b).

San Joaquin kit fox populations exist among patches of suitable and sub-marginal habitat fragmented by highways, roads, urbanization, and agricultural land uses within these counties (Authority and FRA 2012b). According to information provided to the Service from the Authority and FRA in an April, 2012, Memorandum, and a report published by the Endangered Species Recovery Program, California State University, an extant and well-documented population of San Joaquin kit fox exists the south of Santa Nella, California located about 40 miles west of the project action area (Constable et al. 2009; Authority and FRA 2012b). The Service is also aware of observations of San Joaquin kit fox east/northeast of this population within intervening areas of suitable habitat in western Merced County between U.S. Highway 5 and State Highway 99 documented in thirteen CNDDB records (Occurrence #'s 47, 195, 369, 372, 600, 601, 602, 872, 876, 877, 878, 881, and 882; CNDDB 2012).

Loss and fragmentation of habitat is one of the primary threats within and around the project action area. Over 90 percent of former San Joaquin kit fox habitat has been converted to agricultural uses, urbanization, and residential development (Service 2010). Connectivity among existing San Joaquin kit fox populations is limited by existing highways, roads, the BNSF rail line, urban development, and incompatible agricultural land uses (Service 2010; Spencer et al. 2010). The proposed route for Merced to Fresno alignment will intersect with several movement corridors identified for this species (Service 2010; Spencer et al. 2010). These corridors provide habitat to support the movement of San Joaquin kit fox among populations and core habitat areas that support denning and foraging for this species.

Other threats to the San Joaquin kit fox within the project action area include the use of rodenticides and other pesticides, exposure to infectious diseases, competition with other carnivores, and predation by coyotes or bobcats. The use of rodenticides and pesticides on agricultural lands may decrease prey availability for this species, and inadvertently result in mortality of San Joaquin kit foxes that ingest prey exposed to these substances. Limited prey abundance could bring San Joaquin kit foxes into conflict and competition with other wild carnivore species (White et al. 1994, 1995, and 2000; Nelson et al. 2007). San Joaquin kit foxes may be exposed to infectious diseases, such as rabies or canine distemper virus, through contact with infected wildlife or domestic animals (White et al. 2000; Cypher, pers. comm., 2012). Larger carnivores, such as coyotes, are known to opportunistically prey upon San Joaquin kit foxes (White et al. 1994, 1995, and 2000; Nelson et al. 2007; Service 2010).

The San Joaquin kit fox, a wide-ranging species, has been reported throughout Merced, Madera, and Fresno Counties (CNDDB 2012). Therefore, it is reasonably likely that San Joaquin kit fox may be present within the counties surrounding the Merced to Fresno alignment, and the species would use suitable habitats within the project action area. West of Highway 99 from the Hatfield State Recreation Area through western Fresno County, there are over 25 occurrences of San Joaquin kit fox recorded in the CNDDB, 10 of which were documented from 1975 through 2000 within 12 to 15 miles of the proposed route for Merced to Fresno alignment (CNDDB 2012). The majority of these occurrences report observations of one to two adults and/or juveniles in both natural habitat areas and agricultural lands.

The information documented in occurrence # 195 suggests the existence of a small San Joaquin kit fox population within dispersal range of the project action area (approximately 12 miles). Occurrence # 195 documents the results of surveys that were conducted over several days in late August, 1999, outside of the pupping season (occurrence # 195; CNDDB 2012). During these surveys, several adult San Joaquin kit foxes, many tracks, scats, and about 67 potential dens were observed. This occurrence was located in the vicinity of Chamberlain Road south of the Merced National Wildlife Refuge within the Eastman Lake-Bear Creek corridor, identified as a critical for maintaining connectivity among San Joaquin kit populations in the *Recovery Plan for Upland Species of the San Joaquin Valley* (USFWS 1998; Occurrence # 195; CNDDB2012).

The remaining 15 occurrences, which were located approximately 20 to 30 miles west of the project action area were documented from 1920 to 1999. Several of these occurrences document individuals were taken for museum specimens during 1920 (CNDDB 2012). The occurrences recorded from 1971 through 1999 document isolated observations of only one or two adults, individual juveniles, a few dens, or road-killed individuals (CNDDB 2012).

There are six documented occurrences of San Joaquin kit fox located east of Highway 99, near Merced (CNDDB 2012). Occurrence # 89 was a recorded in 1993 as a road mortality along Highway 99 near Herndon in Fresno County within the project action area (CNDDB 2012). Two adult San Joaquin kit foxes were observed foraging in an almond orchard within 2.5 miles of the project action area during May, 2001 (occurrence #25; CNDDB 2012). A single adult was observed in an area of annual grassland located approximately 5 miles from the project action area during April, 2001 (occurrence #24; CNDDB 2012). Individual adults were also observed (occurrences #'s 26 and 30) within five miles of the project action area during 1999 and 2001 (CNDDB 2012). The sixth occurrence (CNDDB # 23), located approximately 5 miles northwest of Merced on private residential and agricultural lands, consisted of individual adults and juveniles observed during surveys conducted during 1999.

The Service is not aware of any recent or on-going studies in Merced, Madera, and Fresno Counties that could provide updated information regarding the current status of the San Joaquin kit fox within this portion of its range. Radio-telemetry studies of San Joaquin kit fox in these counties have not been conducted. Therefore, information regarding San Joaquin kit fox habitat use and movement within these counties is currently unavailable.

San Joaquin kit fox, within eastern portions of Merced, Madera, and Fresno Counties that surround the project action area, currently exist as extremely small, isolated populations among fragmented patches of habitats(Cypher in litt. 2007; Cypher, pers. comm., 2012). Interactions between small population size, existing threats, and environmental stochasticity, could result in decreased reproductive rates, increased mortality, and increased vulnerability to extinction for San Joaquin kit fox populations under these circumstances (Cypher in litt. 2007; Cypher, pers. comm., 2012).

Synergistic effects of existing threats could trap these small San Joaquin kit fox populations in an extinction vortex, thereby compromising their long-term survival and recovery. The extinction vortex model predicts that very small, isolated populations are more likely to become smaller and increasingly vulnerable to extinction with each generation due to the interaction of non-genetic and genetic factors (Gilpin and Soulé 1986; Soule and Mills 1998; Mills 2007). Deterministic and stochastic factors, such as weather, competition, predators, food abundance, population age structure, sex ratios, and intrinsic reproductive and mortality rates can drive extremely small isolated populations into the extinction vortex (Gilpin and Soulé 1986; Soule and Mills 1998; Mills 2007). Stochastic threats, such as droughts or outbreaks of infectious diseases, may interact with and exacerbate problems caused by deterministic factors though feedback mechanisms that can drive a population toward extinction (Mills 2007). Each turn through the feedback cycle in the extinction vortex increases the probability of extinction of small populations (Mills 2007). The extremely small San Joaquin kit fox populations that exist within the counties surrounding the project action area may be vulnerable to becoming trapped in the feedback mechanisms of an extinction vortex because of both deterministic factors and stochastic threats that may occur.

Genetic studies revealed low levels of genetic diversity among San Joaquin kit foxes sampled from small populations located in Los Banos and Panoche (Schwartz et al. 2005). An average of two to three alleles per locus was observed among a set of eight nuclear microsatellite loci used for this study (Schwartz et al. 2005). Three loci were fixed for a single allele in the Los Banos samples. Statistical analyses of the genetic data for the Los Banos samples suggested inbreeding within an ephemeral San Joaquin kit fox population composed of one or two family groups (Schwartz et al. 2005). Low allelic diversity among samples from the Panoche site suggested founder effects and limited genetic exchange with other populations (Schwartz et al. 2005). However, analyses of their genetic data conducted using the *GeneClass* assignment test resulted in at least two samples from Los Banos to the Panoche site, which are located about 20-30 miles apart. Two other samples were assigned to the Carrizo Plain, which is located over 100 miles from these areas. Only a single sample was assigned to Los Banos (Schwartz et al. 2005). Schwartz et al. (2005) concluded that contemporary gene flow (last 100 years) has occurred among all existing San Joaquin kit fox populations and genetic differentiation observed among these populations increased with geographic distance. The low genetic diversity observed among San Joaquin kit fox from Los Banos and Panoche suggests that gene flow into these areas may have become more restricted because of increased development and conversion of intervening habitat (Schwartz et al. 2005).

The two small populations sampled at Los Banos and Panoche are located about 20 to 30 miles west of the project action area. This is approximately the same distance between the study sites sampled for the Schwartz et al. (2005) study). It is reasonably likely that a "stepping-stone" model of genetic exchange among San Joaquin kit fox populations from these two study areas and the small populations that range within and around the project action area may have occurred in the past, and some limited genetic exchange may continue to occur.

San Joaquin kit fox has the potential to occur in areas of suitable and sub-marginal habitat throughout the project action area. Suitable foraging and breeding habitat for the San Joaquin kit fox in the project action area may be found in natural lands such as annual grassland, barren, and pasture and compatible-use agricultural lands. Approximately 46,448 acres of habitat highly suitable for occupancy by San Joaquin kit fox occurs within Merced, Madera, and Fresno counties (Table 5). Compatible-use agricultural lands constitute about 171,543 acres that provide suitable habitat for movement and foraging by this species (Table 5). Although the species may be observed using compatible-use agricultural lands throughout the Merced to Fresno Section, San Joaquin kit fox may have greater potential to den and breed in natural habitat found within conservation areas. San Joaquin kit fox may occur within linkage areas and satellite recovery areas identified in the *Recovery Plan for Upland Species of the San Joaquin* Valley, *California* (Service 1998) and the *San Joaquin kit fox (Vulpes macrotis mutica) 5-Year Review: Summary and Evaluation* (Service 2010), which intersect with the project action area. Large blocks of natural areas identified in the California Connectivity Project linkages, within dispersal distance of the project action area, may provide high quality natal and non-natal denning habitat for the support San Joaquin kit fox (Spencer et al. 2010).

Table 5. Current estimates of suitable habitat for San Joaquin kit fox (Cypher, pers. comm., 2012).

County	Suitable Habitat/Natural Areas*	Compatible-Use Agricultural Lands **	Total Per County
Merced	10,761	80,523	91,284
Madera	3,015	33,310	36,325
Fresno	32,672	57,710	90,382
Totals Per Category	**46,448**	**171,543**	**217,991**

* Highly suitable for occupancy by San Joaquin kit fox; provides habitat for denning, breeding, and foraging.

** Suitable for movement of San Joaquin kit fox among areas of more suitable habitat; provides potential habitat for foraging and limited denning habitat.

Although agricultural lands may be suboptimal for San Joaquin kit fox breeding, individuals may use agricultural lands for foraging and dispersal. Grain crops and alfalfa, in particular, may host populations of prey species for San Joaquin kit fox. Agricultural lands within one mile of natural habitat may be used more frequently for foraging and dispersal than agricultural lands isolated from movement corridors and natural lands (Warrick et al 2007). Telemetry studies of San Joaquin kit fox in Kern County revealed use of a natural 196-foot wide grassland area within a 32 kilometer ROW along an aqueduct (Warrick et al 2007). Live trapping revealed high densities and diversity of rodents in this area and remains of murid rodents were found in 79 percent of San Joaquin kit fox scats (Warrick et al 2007). It is possible that San Joaquin kit fox may use similar areas, such as the ROW, and compatible-use agricultural lands within the project action area for foraging and denning. This same study also revealed that orchards were used disproportionately greater than their availability in the study area (Warrick et al 2007). Almond orchards are the most common agricultural crop within the project action area and may be used by local San Joaquin kit fox (Table 6, below).

Central California tiger salamander

There are 80 central California tiger salamander occurrences documented within portions of Merced, Madera, and Fresno counties that surround the project action area, including several within vernal pools within, and immediately adjacent to, the Great Valley Conservation Bank north of the Chowchilla River located approximately 2 to 3 miles from the project action area (occurrence #'s 307, 901, 989, 990, 991, and 1021) (CNDDB 2012). Four occurrences have been documented within 1.25 miles of the project action area (occurrence #'s 306, 307, 309 and 684; CNDDB 2012). Two occurrences located within the project action area are presumed extirpated, one located near Fresno and another close to Madera (occurrence #'s 583 and 616, respectively; CNDDB 2012). Central California tiger salamander larvae were identified in vernal pool habitat near the intersection of White Rock Road and Santa Fe Avenue located about 0.5 mile northwest of the Great Valley Conservation Bank during special-status plant surveys in 2011 (Authority and FRA 2011). Protocol-level surveys for this species have not been conducted within the project action area.

Evidence of hybridization with non-native tiger salamanders was detected in 10 central California tiger salamander larvae sampled from ponds within occurrence # 901, which is located immediately adjacent to Great Valley Conservation Bank (Fitzpatrick et al. 2010; CNDDB 2012; Bielfeldt, pers. comm., 2012). Occurrence #'s 307, 989, 990, and, 991 are located within 0.25 to 0.80 mile of occurrence # 901. Central California tiger salamanders may travel at least 0.5 to 1 mile among breeding ponds (Trenham and Shaffer 2005; Searcy and Shaffer 2008; Wang et al 2009). While it is not known whether hybrid central California tiger salamanders have spread among other breeding ponds near occurrence #901, the combination of proximity to known hybrid locations, the known dispersal distance of adult and juvenile salamanders, and the documented transmission of these hybrid alleles across the landscape make it reasonably likely that hybridization could be introduced to nearby breeding ponds.

Potentially suitable aquatic and upland habitat has been identified within the project action area. Preliminary habitat surveys identified suitable habitat for all life-history stages of the central California tiger salamander, such as vernal pools and other seasonal wetlands, California annual grasslands, and some agricultural lands, such as pastures and dry land grain crops that support small burrowing mammals, throughout the project action area. However, many areas of suitable upland habitat may be fragmented and isolated from suitable breeding habitat as a result of urbanization, highways, roads, lands subjected to certain types of agricultural practices, and other areas subject to incompatible land uses and development. For example, agricultural fields may be regularly disked or turned, which may destroy burrows and potentially crush or smother central California tiger salamanders. Agricultural lands may also be subject to frequent rodenticide application, which may directly kill small mammal species and reduce burrow availability for Central California tiger salamanders (upland refugia) in fallowed or pasture land.

Conservancy fairy shrimp

Wetland delineation surveys identified seasonal wetlands and vernal pools within the project action area that could provide habitat for conservancy fairy shrimp. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are six occurrences of conservancy fairy shrimp documented within Merced County, two of which are located with 2 to 6 miles of the project action area (occurrence #'s 34 and 35) (CNDDB 2012). It is reasonably likely that conservancy fairy shrimp may exist within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Vernal pool fairy shrimp

Wetland delineation surveys identified other seasonal wetlands and vernal pools within the project action area that could provide habitat for vernal pool fairy shrimp. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are 184 occurrences of vernal pool fairy shrimp documented within Merced, Madera, and Fresno Counties, including four occurrences located within the project action area (occurrence #'s 12, 153, 181, and 310; CNDDB 2012). Vernal pool fairy shrimp were captured from a pool located on the south side of Avenue 13, about 0.1 mile east of the UPRR tracks in 1994 (occurrence # 12; CNDDB 2012). Vernal pool fairy shrimp were observed in at least three of eight vernal pools during a 1993 survey (occurrence # 153; CNDDB 2012). An adult vernal pool fairy shrimp was collected from a roadside vernal pool adjacent to railroad tracks in 1997 (occurrence # 181; CNDDB 2012). Twenty-five adult and juvenile vernal pool fairy shrimp were discovered in tire tracks near a seasonal wetland that had become inundated during 1997 (occurrence # 310; CNDDB 2012). It is reasonably likely that the vernal pool fairy shrimp is present within the project action area because suitable habitat is present and presence of this species within the action area has been documented in CNDDB records.

Vernal pool tadpole shrimp

Wetland delineation surveys identified seasonal wetlands and vernal pools within the project action area that could provide habitat for this species. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are 34 occurrences of vernal pool tadpole shrimp documented within Merced County (CNDDB 2012). Eleven of these occurrences are located within 5 to 6 miles of the project action area (occurrence #'s 2, 3, 81, 123, 130, 187, 195, 244, 262, 263, and 264). None of these occurrences are located within the project action area. It is reasonably likely the vernal pool tadpole shrimp is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Valley elderberry longhorn beetle

Three elderberry shrubs were documented within the project action area, and additional 12 elderberry shrubs were observed within 400 feet of the action area during botanical surveys conducted in 2010 and 2011. However, protocol surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are six occurrences of Valley elderberry longhorn beetle documented within close proximity to the project action area (CNDDB 2012). The nearest Valley elderberry longhorn beetle occurrence is located less than one mile east of the Merced to Fresno Section (Occurrence # 134; CNDDB 2012). Occurrence # 121 is located within 4.5 miles east of the project action area. It is reasonably likely that the Valley elderberry longhorn beetle is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Colusa grass

Potentially suitable vernal pool habitat for Colusa grass has been identified within the project action area. Colusa grass was not identified during a plant survey conducted in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are 22 occurrences of Colusa grass documented within Merced County (CNDDB 2012). Distances among these occurrences range from 0.5 to 5.5 miles, and average about 2 to 3 miles. All of these occurrences are located within Merced County (CNDDB 2012). The closest occurrences are located 4 to 5 miles from the project action area (occurrence #'s 39 and 42; CNDDB 2012). Critical habitat for this species is located approximately 2 miles southwest of the Merced to Fresno Section. It is reasonably likely that the Colusa grass is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

San Joaquin Valley Orcutt grass

Potentially suitable vernal pool habitat for San Joaquin Valley Orcutt grass has been identified within the project action area. San Joaquin Valley Orcutt grass was not identified during a plant survey conducted in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are over 24 occurrences of San Joaquin Valley Orcutt grass documented within several miles of the project action area, including one possibly extirpated occurrence (CNDDB 2012). A single occurrence is located within the project action area (occurrence # 10), where San Joaquin Valley Orcutt grass was identified within dry vernal pools along Santa Fe Avenue, which appears to be isolated from the four closest occurrences of this species, which are located 2 to 4 miles away (occurrence #'s 38, 39, 51, and 62; CNDDB 2012). San Joaquin Valley Orcutt grass is wind-pollinated (Stone et al. 1988). Given the distance of occurrence # 10 from other known locations of this species, it is likely that the existing plants constitute a small, but demographically and genetically discreet population of San Joaquin Valley Orcutt grass. It is reasonably likely that the San Joaquin Valley Orcutt grass is present within the project action area because suitable habitat is present and an occurrence of this species within the action area has been documented in CNDDB records.

Hairy Orcutt grass

Potentially suitable vernal pool habitat for hairy Orcutt grass has been identified within the project action area. Hairy Orcutt grass was not identified during a plant survey conducted in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. Eight occurrences of hairy Orcutt grass have been documented within 10 miles of the project action area. A single occurrence located within pools east of the BNSF Railway along Avenue 15, within the project action area (occurrence # 19), appears to be isolated from the four closest occurrences of this species, which are located 1.5 to 4.5 miles away (occurrence #'s 9, 11, 15, and 18; CNDDB 2012). Over 1,000 plants were observed at this location in 1982. However, only three individuals were observed in 1986, and the habitat had been diminished as a result of grazing, disking, and invasion of non-native plant species (CNDDB 2012). Hairy Orcutt grass may be pollinated via insects or wind (Stone et al. 1988). Geographic distance, intervening habitat-type, urban development, and other landscape features may influence pollinator-mediated gene flow among populations (Montalvo et al. 1997; Rogers and Montalvo 2004; Leimu et al. 2006). Foraging home-ranges may be as low as 150 to 300 meters (492 to 984 feet) for the smaller native bees, and up to 1,200 meters (3,937 feet) for the larger non-native bee species (Thorp, pers. comm., 2010). Therefore, populations of hairy Orcutt grass that are separated by more than 1,200 meters may not be connected by insect-mediated gene flow. Given the distance of occurrence # 19 from other known locations of this species, the existing plants may constitute a demographically and genetically discreet population of hairy Orcutt grass, if no other nearby populations of this species are discovered through surveys. The nearest critical habitat unit for this species is located 2.61 miles northeast of the Merced to Fresno Section. It is reasonably likely that the hairy Orcutt grass is present within the project action area because suitable habitat is present and a population of this species within the action area has been documented in CNDDB records.

Greene's tuctoria

Potentially suitable vernal pool habitat for Greene's tuctoria has been identified within the project action area. Greene's tuctoria was not identified during a plant survey conducted in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. Nine occurrences of Greene's tuctoria have been documented within 10 miles of the project action area. Two occurrences have been reported in vernal pools near Santa Fe Avenue north of the Chowchilla River, located within 2.5 miles of the project action area (Occurrence #'s 14 and 28; CNDDB 2012). An estimated population of 10,000 plants within a hectare of vernal pool habitat was observed in 1981 (occurrence # 28; CNDDB 2012). However, no plants were observed during a 1986 survey (CNDDB 2012). An unknown number of Greene's tuctoria plants were observed in a vernal pool in 1980, but no plants were observed during subsequent surveys conducted in 1986 (occurrence # 13; CNDDB 2012). It was noted that the hydrology of the vernal pool had been altered by construction of an elevated railroad grade (CNDDB 2012). There are two additional occurrences north of the Chowchilla River about 1 to 2 miles east of Santa Fe Avenue in vernal pool habitat located within the Great Valley Conservation Bank (occurrence #'s 46 and 54; CNDDB 2012). Over 30 individuals were documented during a field survey conducted in 2000 (occurrence # 46; CNDDB 2012). Approximately 200 plants were observed during a 2010 field survey (occurrence # 54; CNDDB 2012). It is reasonably likely that the Greene's tuctoria is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Succulent owl's-clover

Potentially suitable vernal pool habitat for succulent owl's-clover has been identified within the project action area. Succulent owl's-clover was not identified during a plant survey conducted in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are 59 occurrences of succulent owl's-clover documented in the CNDDB within 10 miles of the project action area (CNDDB 2012). Two of these occurrences are located within 1.5 to 2 miles of the project action area (occurrence #'s 62 and 97; CNDDB 2012). It is reasonably likely that the succulent owl's-clover may exist within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Effects of the Proposed Action

The CHST-MF Project will result in temporary and permanent loss of habitat for the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover.

San Joaquin kit fox

Construction-related effects

Direct and indirect effects are reasonably likely to occur to the San Joaquin kit fox may within 13,081 acres of the 22,643-acre project action area (Table 5). An estimated 1,279 acres of suitable habitat (grassland and compatible-use agricultural lands) for the San Joaquin kit fox will be permanently lost as a result of the CHST-MF Project (Table 5). However, these habitats occur as fragments or patches throughout the relatively narrow, linear project action area, primarily within Merced and Madera Counties. Approximately 109 acres of the 1,279 acres (~ 9 percent) of suitable habitat is considered to be highly suitable for use by the San Joaquin kit fox. The remaining 1,170 acres consists primarily of compatible-use agricultural lands (Table 6). The 109 acres of highly suitable habitat that will be permanently lost as a result for the CHST-MF Project represents significantly less than one percent of remaining combined highly suitable habitat within Merced, Madera, and Fresno counties (Table 5; 46,448 acres; Cypher, pers. comm., 2012). Habitat loss and alteration may occur through degradation and placement of hardscape over suitable denning or foraging habitat. It is reasonably likely that construction activities will result in the destruction of dens. Alteration and loss of suitable foraging and denning habitat will result in increased vulnerability of San Joaquin kit fox to predation and a reduction in prey availability.

Table 6. Suitable Habitat for the San Joaquin kit fox in the Merced to Fresno Section.

	Design Option 1			Design Option 2		
Habitat Type	**Acres Within Footprint**	**Acres Within 1000 Feet of Edge of Project Footprint**	**Total Per Habitat Type**	**Acres Within Footprint**	**Acres Within 1000 Feet of Edge of Project Footprint**	**Total Per Habitat Type**
Pasture*	21.61	268.14	289.75	13.12	188.17	201.29
Orchard	263.42	2,746.00	3,009.42	387.02	4,050.93	4,437.95
Rural Residential	57.51	801.28	858.79	111.09	1,096.16	1,207.25
Inactive Agriculture	193.90	1,605.26	1,799.16	181.61	1,275.14	1,456.75
Field Crop	149.70	1,689.11	1,838.81	257.38	2,793.70	3,051.08
Fallow Field	175.15	1,257.61	1,432.76	236.78	1,544.76	1,781.54
Barren*	37.30	256.16	293.46	42.19	286.44	328.63
Annual Grassland*	49.54	565.45	614.99	49.87	566.53	616.40
TOTALS=	**948.13**	**9,189.01**	**10,137.14**	**1,279.06**	**11,801.83**	**13,080.89**
Permit Phase 1 (CP1)						
Pasture*	1.49	63.99	65.48	1.65	55.96	57.61
Orchard	76.45	1,104.53	1180.98	76.46	1,089.85	1166.31
Rural Residential	30.67	415.51	446.18	33.28	412.17	445.45
Inactive Agriculture	77.4	590.63	668.03	76.21	588.29	664.5
Field Crop	31.51	209.55	241.06	31.51	209.55	241.06
Fallow Field	42.53	251.78	294.31	42.53	251.77	294.3
Barren*	33.08	245.34	278.42	30.18	248.26	278.44
Annual Grassland*	32.42	444.13	476.55	32.42	444.13	476.55
TOTALS=	**325.55**	**3,325.46**	**3,651.01**	**324.24**	**3,299.98**	**3,624.22**

* Highly suitable habitat; Suitable for occupancy by San Joaquin kit fox; provides habitat for denning, breeding, and foraging

The proposed construction activities have the potential to expose San Joaquin kit fox to a range of adverse effects and forms of take. Loud noise, lighting, and vibration caused by construction vehicles, equipment, and operation of the HST may disrupt normal breeding, feeding, or sheltering behaviors of San Joaquin kit fox individuals. However, the Authority has proposed to implement conservation measures such as minimizing the total area disturbed by project activities, enforcement of speed limits, and properly constructed exclusionary fencing, which will reduce the potential for mortality, injury, or harassment of the San Joaquin kit fox. Preconstruction surveys for San Joaquin kit fox will reduce the potential for injury or mortality as well. Therefore, injury or mortality from entrapment, behavioral disruption from noise and vibrations, or collision with construction equipment and vehicles is not expected to occur.

In the event that San Joaquin kit fox do not vacate the project action area after passive harassment measures have been implemented, as described in conservation measure #5 for this species, or a San Joaquin kit fox has become accidently trapped within the project action area, the Authority will contact the Service. Capture and relocation of San Joaquin kit fox is not currently proposed or authorized as a conservation measure for this project.

Movement and connectivity

Maintaining current connectivity among existing San Joaquin kit fox populations among habitats and populations is crucial for minimizing the threat of extinction. Therefore, the Authority has proposed construction of 17 to 24 dedicated wildlife crossings to ensure connectivity for the San Joaquin kit fox within areas identified as movement corridors and linkages to core recovery areas. Elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage structures (e.g., large-diameter culverts 60 to 120 inches) may also facilitate movement of San Joaquin kit foxes. Dedicated wildlife crossings for the San Joaquin kit fox will be spaced at approximately 0.3-mile intervals within the Eastman Lake-Bear Creek Essential Connectivity Area. Wildlife crossings in areas where adjacent land uses are relatively conducive to wildlife movement (e.g., grazing land; grain, hay, and idle pasture) will be constructed approximately every 2.5 miles. The spacing and location of dedicated wildlife crossings for the Merced to Fresno Section was based on (1) existing land uses; (2) existing and proposed infrastructure not associated with the CHST-MF Project; (3) previously identified wildlife movement corridors; and (4) consistency with the *Recovery Plan for Upland Species of the San Joaquin* Valley, *California* (Service 1998).

Existing highways, roads, the BNSF rail line, urban development, and incompatible agricultural land uses may restrict movement of individuals and connectivity among existing San Joaquin kit fox populations (Service 2010; Spencer et al. 2010). Greater than 75 percent of the HST (~ 60 miles) will be installed at-grade. Portions of at-grade tracks will occur through areas that currently facilitate connectivity. Security fencing will be installed wherever the tracks are at-grade. Without the incorporation of wildlife crossing structures into the project design, the installation of long expanses of at-grade tracks with security fencing could potentially result in loss and fragmentation of habitat and severely limit connectivity among San Joaquin kit fox habitats and populations, and preclude recolonization of currently unoccupied historic habitat. Therefore, the proposed wildlife crossings are crucial for maintaining connectivity among existing San Joaquin kit fox populations within and around the project action area.

The proposed design for the wildlife crossing is based on studies of use of highway undercrossings by San Joaquin kit fox, and other medium-sized mammals, such as the swift fox. Studies sponsored by the California Department of Transportation on highway undercrossings offered some insight into a minimum OF (as defined in conservation measure 1.a.) for San Joaquin kit foxes, but the results of these studies were not conclusive (Bremner-Harrison et al. 2007). In one study, use of crossing structures under four-lane divided highways by San Joaquin kit foxes was examined at three study sites: one each along Interstate 5, SR 58, and SR 14. San Joaquin kit foxes were confirmed to be present at all three sites (Bremner-Harrison et al. 2007). A total of 45 undercrossing structures were monitored at the three separate sites. OFs ranged from 0.001 to 5.70, with most values estimated at the lower end of this range. Although San Joaquin kit foxes explored the entrances to some of these structures, no evidence was found of foxes crossing completely through any of the structures. However, there was incidental evidence that San Joaquin kit foxes preferred the use of road overcrossings at all three study sites.

In another study, use of crossing structures by swift foxes (*Vulpes velox*) was examined along four-lane divided highways in Colorado and South Dakota (Clevenger et al. 2010). At the Colorado site, 24 structures were monitored. Swift foxes were detected completely crossing through several 213-foot long culverts with OFs ranging from 0.12 to 0.45. At the South Dakota site, 49 structures were monitored. Swift foxes were detected completely crossing through six structures, all of which were round culvert designs with OFs ranging from 0.23 to 0.81.

Arizona Game and Fish Department (AGFD) guidelines for crossing structures recommend a minimum OF of 0.4 for medium-sized mammals, including foxes (AGFD 2006). The AGFD guidelines also recommend spacing wildlife crossings every 500 to 1,000 feet in areas designated as movement corridors for medium-sized mammals when the expanse will exceed at least one-half mile. An opening of at least 30-square feet (3 feet x 10 feet) was recommended for wildlife crossings that would have a length of 75 feet (AGFD 2006).

The proposed design for all wildlife-designated crossing structures for the HST is based on the findings of the swift fox study by Clevenger et al. (2010) study and AGFG recommendations, and consists of box culverts and short-span slab bridges, located below the HST tracks. Box culverts will be installed where the track elevation is 9.5 feet or greater above the grade of the existing ground, and a short-span bridge will be installed when tracks are less than 9.5 feet above that grade. The proposed crossing structures will provide an opening that is either 3 feet or 6 feet high, 10 feet wide, and 73 feet long (OF = 0.41 or 0.82, respectively). The invert or bottom of the structure opening may extend below the existing grade to accommodate variations in the topography. However, all wildlife crossings will have at least 50 percent of the vertical clearance above grade of the approaches to the opening. This will allow San Joaquin kit foxes entering the crossing to see through to the opening at the opposite end of the structure.

An OF and crossing design that would facilitate movement of San Joaquin kit fox across barriers, such as roads and railroad tracks, was not determined through previous studies for this species because most of the study sites had very small OFs (< 0.10) (Cypher, pers. comm., 2010, 2011, and 2012). However, data from studies of closely related fox species of similar body size suggest that the proposed dimensions for the crossing structures may be suitable for San Joaquin kit foxes (Cypher, pers. comm., 2010, 2011, and 2012). The crossings with the highest OF (0.81) may provide the most suitable dimensions for facilitating movement of San Joaquin kit foxes through these structures (Cypher, pers. comm., 2012). Therefore, the dimensions of the proposed wildlife crossings are expected to facilitate movement of San Joaquin kit fox across the HST.

Other structures that will be constructed for the Merced to Fresno alignment, such as road overcrossings, spans, and bridges, may provide opportunities for movement of San Joaquin kit fox. The Merced to Fresno alignment will include 36 to 43 road overcrossings to accommodate existing two-lane roads that will intersect with the HST. These road overcrossings provide opportunities for a variety of terrestrial wildlife species to cross over the alignment, especially on roads with low traffic volume. San Joaquin kit fox have been documented to use road overcrossings to gain access across highways (Bremner-Harrison et al. 2007; Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012). Therefore, the proposed road overcrossings will provide numerous opportunities for movement of San Joaquin kit fox across the HST (Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012).

Several large bridges and spans that will be constructed across rivers, creeks, and other aquatic or land features may also provide opportunities for movement of San Joaquin kit fox (Cypher in litt. 2010 and 2011, and Cypher pers. comm., 2012). This includes the crossing at the San Joaquin River, which contains an elevated section of approximately 2 linear miles of track; the Fresno River crossing, which includes approximately 0.5 mile of elevated track; and elevated sections associated with the design options and crossing points for existing infrastructure, such as SR 99 and existing rail rights-of-way. Elevated track for the Merced to Fresno alignment with the design option with the greatest impacts to federally listed species includes approximately 10 linear miles of track near Chowchilla and the Fresno River, as well as the San Joaquin River crossings described above.

The Merced to Fresno alignment will also include 18 to 20 smaller hydraulic crossings. Hydraulic crossings include bridges at Miles Creek, Owens Creek, Duck Slough, Deadman Creek, Dutchman Creek, Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Dry Creek, Schmidt Creek and Cottonwood Creek. Other viable crossings include elevated portions of track over Berenda Slough, the Fresno River, and the San Joaquin River. These small hydraulic crossings may provide opportunity for movement of San Joaquin kit fox under the HST.

Exposure to predators and infectious diseases

The wildlife crossings may be used by other motile species such as coyotes, bobcats, feral cats and stray dogs to gain access across the HST tracks. Therefore, it may be likely that San Joaquin kit foxes may experience increased encounters with potential predators, when using the proposed crossing structures. There may be potential for mortality if San Joaquin kit fox encounter predators while traveling parallel to the rail line in search of a crossing opportunity. However, artificial escape structures will be installed within the crossing structures that will provide temporary escape. Four sections of CMP, 20 feet long and 10 inches in diameter, will be anchored at equal intervals on the floor of each crossing structure. The openings of both ends of all CMPs will be narrowed to a 4 to 6 inch diameter. San Joaquin kit foxes may find temporary refuge opportunities within the CMPs in the event they encounter a larger predator. The Authority has proposed to construct 17 to 24 dedicated wildlife crossings at 0.3-mile intervals, which should provide numerous opportunities for San Joaquin kit fox to gain access across the HST while minimizing the risk of encountering predators. Therefore, the potential for encounters with predators within and around wildlife crossings will be minimized through installation of the proposed wildlife crossings and artificial denning habitat, and mortality from predation is not expected to occur within these structures.

The installation of the proposed wildlife crossing structures and escape dens, as described above, will also provide refuge that will allow San Joaquin kit fox to minimize or avoid contact with infected animals carrying transmissible infectious diseases when using the crossing structures. Increased interface between rural areas, agricultural lands and urban development may result in higher densities of wild and domestic species that benefit from human activities in these areas (Bradley and Altizer 2006). Raccoons, coyotes, skunks, red foxes, gray foxes, feral cats, and stray dogs may occur at higher densities than San Joaquin kit fox within and around the project action area where an interface between agricultural lands and urban development exists within and around the Cities of Fresno, Madera, Chowchilla, and Merced (Cypher et al. 2005; Smith et al. 2006; Service 2010). These animals, especially raccoons and other small species may use the proposed crossing structures. For example, raccoons were detected at highway undercrossings in southern California more frequently than any other wild mammal species (Ng et al. 2004). Skunks, cats, and dogs were also detected using these undercrossings as well (Ng et al. 2004). These wild and domestic animals may carry transmissible infectious diseases, such as rabies, canine distemper virus, sarcoptic mange, and canine parvovirus (Cypher et al. 1998; Burton and Doblar 2004; Riley et al. 2004; Cummings et al. 2009). The number of crossing structures proposed and spacing intervals will provide sufficient opportunities for movement of San Joaquin kit foxes across the HST and minimize the probability of exposure to infected animals. Therefore, it is extremely unlikely for San Joaquin kit fox to be exposed to infected animals while using the proposed wildlife crossing structures.

Exposure to increased noise levels

San Joaquin kit fox currently experience noise disturbance from Highway 99 traffic and operation of trains on the BNSF rail line. Approximately 20 to 24 trains are operated on both the UPRR and BNSF railroads. Of these, 12 are passenger Amtrak trains which operate about every hour and a half generally during daytime hours with the last train arriving into Fresno from the north at around 10:00 p.m. The remaining 10 to 12 trains operated on these railroads are freight trains. The operation of the Merced to Fresno Section may result in additional noise disturbance that may temporarily impair behavioral patterns of this species and their prey. According to the proposed schedule for train operations, northbound and southbound trains will travel in each direction at least two to three times per hour from 5:00 a.m. to 12:00 a.m. (up to 57 train passages per day). However, noise disturbance from operation of the HST will not occur during nocturnal activities of San Joaquin kit fox in areas adjacent to the alignment from 12:00 am through 5:00 a.m. (~ 5 hours).

The FRA has established noise exposure limits for all wildlife at a sound exposure level (SEL) of 100 dBA from passing trains. Construction equipment, such as bulldozers, may produce noise in the range of 85 dBA (Burgland and Lindvall 1995). Assuming no intervening structures and maximum speeds of 220 mph, the Authority has estimated that 100 dBA SEL will occur within 100 feet from the trackway centerline for at-grade crossings, and estimated 15 feet from the centerline for elevated sections on structures. This noise level is comparable to a helicopter operating at the same distance (Service 2006c). It is expected that the 100 dBA SEL would be exceeded consistently throughout all alternatives for an estimated 50 feet outside the at-grade crossings on both sides.

All areas of the HST that are at-grade within suitable habitat are expected to experience increased noise exposure that may exceed the 100 dBA SEL threshold and potentially elicit a temporary startle, avoidance or negative behavior from San Joaquin kit fox and their prey. However, San Joaquin kit fox studied in Bakersfield, California, which appear to have adapted to the urban environment, have been observed denning near major roads (Bjurlin et al. 2005). Several San Joaquin kit fox were also observed using culverts and other road structures as dens in this same study (Bjurlin et al. 2005). Therefore, it is likely that San Joaquin kit fox will become quickly adapted to the increased noise disturbance generated by operation of the HST.

Effects associated with rodent control programs

The Service recognizes that rodent control programs to prevent small mammals, such as ground squirrels, from undermining the stability of the ground below the HST facilities through burrowing activity may be necessary as part of a regular maintenance program. Rodenticides pose a threat to San Joaquin kit fox through direct or secondary poisoning. Mortality of San Joaquin kit fox may occur if rodenticide in a bait application is ingested, or through consumption of rodents that have ingested rodenticides (Orloff et al. 1986; Berry et al. 1992; Huffman and Murphy 1992; Standley et al. 1992; CDFG 1999; Hosea 2000; L. Briden, CDFG, in litt. 2006). San Joaquin kit fox may be adversely affected through reductions of available prey as a result of rodent control programs. San Joaquin kit fox may depend on ground squirrels to create potential burrows in areas where hardpan soil layers occur (Orloff et al. 1986; Orloff 2002). The availability of potential den sites may become limited by rodent control programs (Orloff et al. 1986; Orloff 2002). The Authority will not use chemical rodenticides for track or alignment, particularly in rural areas. To the maximum extent feasible, the Authority will utilize non-toxic rodent control measures to maintain HST facilities. If rodenticides are needed to maintain any buildings or structures, an integrated pest management plan that includes best management practices for avoiding and minimizing off-site impacts on San Joaquin kit fox and other species that might result from use of rodenticides will be prepared and implemented by the Authority and submitted to the Service for review and approval.

Conservation measures for the San Joaquin kit fox

The Authority has proposed to mitigate for the maximum estimated permanent habitat loss the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the San Joaquin kit fox in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. As described in the MSIP, implementation of the mitigation proposal would preserve land within the Eastman Lake-Bear Creek Essential Connectivity Area, which is a terrestrial wildlife movement corridor that traverses the Merced to Fresno HST alignment (Spencer et al. 2010). Linking the natural areas in the Eastman Lake-Bear Creek Essential Connectivity Area with the natural areas east of State Route 99 is listed as a recovery action for San Joaquin kit fox in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998). Two of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, both of which support potential foraging and dispersal habitat for this species, are located within this Essential Connectivity Area. Permanent protection of these lands will help maintain the geographic distribution of the species and contribute to its survival and recovery.

Vernal pool habitat for central California tiger salamander conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover

For the purposes of the impact assessment for vernal pool habitat, the Authority has considered that permanent effects will occur as a result of excavation or fill to vernal pool habitat within the footprint of the HST, and any vernal pool habitat within 250 feet of the footprint. Adverse effects from HST construction and operation activities may be caused by erosion, soil compaction, increased siltation/sedimentation, fractures in the hardpan soils, destruction of native vegetation, and significant alteration of hydrology for vernal pools or seasonal wetlands that provide habitat for vernal pool species. The hydrology of vernal pools may be altered from the loss of a watershed, up-slope destruction of the water restricting layer, and changes in surface topography. Published scientific works conducted in vernal pool landscapes have proven that vernal pools depend not just on rain falling into the pool basin and water flowing overland, but also water flowing below the soil surface (Rains et al. 2006; Rains et al. 2008; Williamson et al. 2005). The proposed project may result in up-slope and or down-slope destruction of the water restricting soil layers and changes in surface topography. When functioning properly, this perched groundwater system flows from the upland landscape to vernal pools and stabilizes vernal pool water levels, causing them to be inundated over larger areas for longer period of time than would be the case if they were recharged only by precipitation (Rains et al. 2006). This subsurface flow occurs on top of the claypan or hardpan that equipment has been perforated or excavated. Excavation of areas with higher elevation inter-mound areas or hardpan perforation in lower areas effectively serves to drain this water from the soil before it enters the vernal pools. Therefore, altered hydrology of seasonally inundated depressions such as vernal pools that provide seasonal breeding habitat for the central California tiger salamander, conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover are reasonably likely to occur as a result of the proposed project.

Further effects to vernal pool habitat include the introduction or further spread of invasive plant species that could potentially affect pool hydrology, and long-term degradation of both vernal pool and upland plant communities. It may be difficult to limit the spread of existing non-native plant species within vernal pool habitat during construction activities. Some invasive species may inadvertently be introduced through seeds carried on workers clothing and shoe wear. However, the introduction of plant species into vernal pool and wetland habitat by construction equipment and vehicles will be limited, to the maximum extent feasible, through implementation of the WCP. All disturbed areas of upland habitat will be restored and revegetated with native plants and seeds following construction under the guidance of the RRP. Construction vehicles and equipment will be mostly limited to existing roads and other developed areas within the project action area.

The implementation of BMPs and the SWWPP will minimize and help to avoid adverse effects from fuel or chemical spills, sedimentation, and runoff from construction areas into vernal pool and wetland habitat for the vernal pool species. Therefore, adverse effects to vernal pool habitat from spills, sedimentation, and runoff are not expected to occur.

Central California tiger salamander

Effects associated with construction activities

We do not anticipate significant mortality, injury, or harassment of central California tiger salamanders to occur, because upland and aquatic habitat for this species occurs intermittently throughout the long, linear project footprint. These small, cryptic animals are at risk from being crushed by project related equipment or vehicles, or construction debris within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Central California tiger salamanders could fall into trenches, pits, or other excavations, and may be directly killed or unable to escape and be subjected to desiccation, entombment, or starvation. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. However, implementation of conservation measures proposed specifically for the central California tiger salamander, such as minimizing the total area disturbed by project activities, conducting pre-construction surveys, and inspecting burrows to make sure individuals are not inadvertently crushed, providing escape ramps in trenches, and properly constructed exclusionary fencing will minimize mortality, injury, or harassment.

Access to suitable upland dispersal and refugia habitat such as grasslands and pastures will become restricted or permanently lost due to permanent structures associated with the CHST-MF Project. Migration and breeding behavior of central California tiger salamander within the project action may be altered as a result of these effects.

Effects associated with operation of the HST

Operation of the Merced to Fresno Section may result in injury or mortality to central California tiger salamanders within the right-of-way. Security fencing along at-grade tracks will not prohibit central California tiger salamanders from accessing the right-of-way. Central California tiger salamanders may access at-grade tracks or track ballast during seasonal migrations between aquatic and upland habitats. This may allow some central California tiger salamanders to gain access across the tracks to upland and wetland habitats, and potential mates. However, operation of the train and routine maintenance activities on the right-of-way may occur during nocturnal rain events when central California tiger salamanders are known to be most active.

Implementation of the proposed conservation measures will significantly reduce adverse effects to Central California tiger salamanders during project construction, maintenance, and operational activities. However, some mortality of central California tiger salamanders may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe.

The CHST-MF Project will result in the permanent loss of up to 27.14 acres of aquatic breeding habitat and 220.46 acres of upland habitat for the central California tiger salamander (Table 7). The Authority has proposed to mitigate for the maximum estimated permanent habitat loss the acquisition of permittee-responsible mitigation sites within Merced, Madera, and Fresno counties that will be protected in perpetuity through conservation easements. These lands will be protected and managed for the conservation of the central California tiger salamander and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP support suitable breeding and aestivation habitat with documented occurrences of this species in all of its life stages. Permanent protection of these lands will help maintain the geographic distribution of the species and its recovery.

Table 7. Estimated permanent upland and aquatic habitat loss for the central California tiger salamander (acres).

Habitat Type	Design Option 1			Design Option 2		
	Effect Type		Total Impact	Effect Type		Total Impact
	Direct	Indirect		Direct	Indirect	
Aquatic	15.57	11.57	**27.14**	15.34	9.87	**25.21**
Upland	71.41	149.05	**220.46**	63.24	116.60	**179.84**
Permit Phase 1 (CP1)						
Aquatic	1.93	7.28	**9.21**	1.93	7.28	**9.21**
Upland	34.07	68.48	**102.55**	34.07	68.48	**102.55**

Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp

Vernal pool habitat occurs within the project action area that may be suitable for conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp. The Service anticipates that direct and indirect effects to these species will occur in areas where vernal pool habitat is identified within the project action area. Effects to each of these listed branchiopod species was calculated by summing the acreage of potentially suitable vernal pool habitats within the project action area, and linking these habitats to CNDDB records for each species within specific USGS 7.5-minute quadrangles as they occur within the Merced to Fresno Section of the HST (Table 8). The construction and operation of the Merced to Fresno Section may result in direct effects on populations of conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp through degradation or loss of seasonally inundated depressions such as vernal pools that support the reproductive cycle of these species. Direct adverse effects, such as harm or mortality from heavy equipment, may also occur during construction of the Merced to Fresno alignment. Construction of the Merced to Fresno Section may result in disruption of upland areas surrounding vernal pool branchiopod habitat that may alter water retention and flow within the landscape and influence the timing and intensity of inundation necessary to support the life cycle of these species.

Conservation measures for the conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp

Implementation of the proposed conservation measure, such as pre-construction surveys, installation of exclusion fencing around vernal pool habitat, and use of erosion control materials, will reduce adverse effects to conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp during project construction, maintenance, and operations.

It is expected that all vernal pool and wetland habitat for the conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp within the alignment foot print and 250 feet of the footprint will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST. Up to 27.14 acres of suitable vernal pool for the vernal pool fairy shrimp and the vernal pool tadpole shrimp may be permanently lost as a result of the proposed CHST-MF Project under Design Option 1 (Table 8). A 19.71-acre subset of this 27.14 acres is suitable vernal pool habitat for the conservancy fairy shrimp (Table 8).

The Authority has proposed to mitigate for the direct effects to habitat for the conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp through acquisition of permittee-responsible mitigation sites within Merced, Madera, and Fresno counties that will be protected in perpetuity through conservation easements and/or through purchase of credits at a Service-approved conservation banks. These lands will be protected and managed for the conservation of the conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Table 8. Estimated permanent habitat loss for conservancy fairy shrimp, vernal pool fairy shrimp, and vernal tadpole shrimp (acres).

	Design Option 1			Design Option 2		
	Effect Type		Total	Effect Type		Total
Species	Direct	Indirect	Impact	Direct	Indirect	Impact
Conservancy Fairy Shrimp	12.76	6.95	**19.71**	12.90	6.49	**19.39**
Vernal pool fairy shrimp and vernal pool tadpole shrimp	15.57	11.57	**27.14**	15.34	9.87	**25.21**
Permit Phase 1 (CP1)						
Conservancy Fairy Shrimp	0.41	5.74	**6.15**	0.41	5.74	**6.15**
Vernal pool fairy shrimp and vernal pool tadpole shrimp	1.93	3.85	**5.78**	1.93	3.85	**5.78**

Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP are located within designated critical habitat for one or more of these species (Service 2006); the acquisition of this designated critical habitat would protect habitat that Service has deemed critical for the survival and recovery of these species. Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP are also located within core areas identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). Vernal pool regions are discrete units that identify areas targeted for the recovery and conservation objectives of vernal pool species; core areas are distinct areas within each vernal pool region that provide the features, populations, and distinct geographic and/or genetic diversity necessary for the recovery of a species (Service 2005). The protection of both occupied and suitable habitat within these core areas is identified as important criteria for the delisting and/or recovery of these species. Implementing the mitigation proposal described in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed wildlife species. Permanent protection of these lands will help maintain the geographic distribution of the species and contribute to the survival and recovery of these species.

Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover

Direct and indirect effects to Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover will be presumed where vernal pool habitat occurs within the project action area. Effects to each of these listed plant species was calculated by summing the acreage of potentially suitable vernal pool habitats within the project action area, and linking these habitats to CNDDB records for each plant species within specific USGS 7.5-minute quadrangles as they occur within the Merced to Fresno Section of the HST (Table 9). The proposed project will result in the permanent loss of vernal pool for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover.

Effects associated with construction

Construction and operation of the Merced to Fresno Section may result in adverse effects to small, isolated populations of San Joaquin Valley Orcutt grass and hairy Orcutt grass that occur within the project action area (Table 9). Vernal pool habitat for these plants within the project action area will be permanently affected through the spread of non-native invasive plant species introduced as seeds and propagules. The introduction and/or spread of non-native plants increase competition for resources (i.e., sun, water, soil nutrients), which may negatively affect flowering success, pollination, seeding, and germination (Gerhardt and Collinge 2003). The introduction of non-native plant species may also significantly alter habitat heterogeneity by out-competing native plants, thereby further facilitating successful invasion of the non-natives. Successful invasion of non-native plant species could result in permanent degradation of suitable habitat for the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover and negatively affect the fitness of populations that occur within the project action area.

Effects associated with operation and maintenance activities

In some areas, where the track is at-grade and drainage swales will be constructed, suitable habitat for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover may occur within swales and portions of the right-of-ways, which may become recolonized by these species. If operation and maintenance activities occur where any of these species have recolonized, or immediately adjacent to the right-of-way, indirect effects may occur where ground disturbing, clearing, or grubbing are necessary, negative effects similar to those described for construction activities may occur during maintenance activities. However, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover, and other native vegetation, will be allowed to reestablish after construction in some areas (primarily associated with temporary construction easements), from the natural soil seed bank.

Conservation measures for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover

Implementation of the proposed conservation measure, such as pre-construction surveys, installation of exclusion fencing around vernal pool habitat, and use of erosion control materials, will reduce adverse effects to Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover during project construction, maintenance, and operations.

It is expected that all vernal pool and wetland habitat for the Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover within the alignment foot print and 250 feet of the footprint will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST. Up to 9.21 acres of suitable vernal pool and wetland habitat for these species may be permanently lost as a result of the proposed CHST-MF Project (Table 9).

The Authority has proposed to mitigate for the maximum estimated permanent habitat loss for each of these species through acquisition of permittee-responsible mitigation sites within Merced, Madera, and Fresno counties that will be protected in perpetuity through conservation easements, and/or through purchase of credits at a Service-approved conservation bank. These lands will be protected and managed for the conservation of the Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Two of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP are located within designated critical habitat for two of these species (Service 2006); the acquisition of this designated critical habitat would protect habitat that the Service has deemed critical for the survival and recovery of these species. Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP are also located within core areas identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern*

Oregon (Service 2005). Vernal pool regions are discrete units that identify areas targeted for the recovery and conservation objectives of vernal pool species; core areas are distinct areas within each vernal pool region that provide the features, populations, and distinct geographic and/or genetic diversity necessary for the recovery of a species (Service 2005). The protection of both occupied and suitable habitat within these core areas is identified as important criteria for the delisting and/or recovery of these species. Implementing the mitigation proposal described in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed wildlife species. Permanent protection of these lands will help maintain the geographic distribution of the species and contribute to the survival and recovery of these species.

Table 9. Estimated habitat loss for the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Green's tuctoria, and the succulent owl's-clover

Species	Design Option 1			Design Option 2		
	Effect Type		Total	Effect Type		Total
	Direct	Indirect	Impact	Direct	Indirect	Impact
Colusa Grass	0.14	0.07	**0.21**	0.14	0.07	**0.21**
Greene's tuctoria	11.68	3.25	**14.93**	12.07	2.19	**14.26**
Hairy Orcutt Grass	12.80	8.58	**21.38**	13.35	7.46	**20.81**
San JoaquinValley Orcutt grass	12.39	9.49	**21.88**	12.39	7.85	**20.24**
Succulent owl's-clover	7.50	6.92	**14.42**	7.11	6.33	**13.44**
Permit Phase 1 (CP1)						
Colusa Grass	0.00	0.00	**0.00**	0.00	0.00	**0.00**
Greene's tuctoria	0.00	0.00	**0.00**	0.00	0.00	**0.00**
Hairy Orcutt Grass	1.06	5.73	**6.79**	1.06	5.73	**6.79**
San JoaquinValley Orcutt grass	0.32	5.66	**5.98**	0.32	5.66	**5.98**
Succulent owl's-clover	0.32	5.66	**5.98**	0.32	5.66	**5.98**

Valley elderberry longhorn beetle

Approximately 3.74 acres of suitable riparian habitat that could support elderberry shrubs and the valley elderberry longhorn beetle will be permanently affected as a result of the CHST-MF Project. At least, three elderberry shrubs have been identified within the project footprint that may be lost and could be subject to Service transplantation guidelines. Other elderberry stands that may be identified within the project action area may be subject to removal or damage during construction activities. Indirect adverse effects to valley elderberry longhorn beetles and their habitat may extend up to 100 feet from both sides of the project footprint during construction of the HST. Surveys for the valley elderberry longhorn beetle and suitable habitat for this species have not been completed throughout most of the project action area because of limited access.

The construction footprint and areas extending up to 100 feet from the edge of the project footprint have the potential to directly and indirectly affect elderberry shrubs and thus potential habitat for valley elderberry longhorn beetle. However, the extent of effect to valley elderberry longhorn beetle habitat will be determined through the amount of elderberry shrubs and stems that will be directly or indirectly affected.

Negative effects to elderberry shrubs may directly affect the survival of valley elderberry longhorn beetle because they are host-specific to this plant species. Valley elderberry longhorn beetle populations may be temporarily affected, both directly and indirectly, by construction, maintenance, and operational activities within the project action area. Construction, maintenance, and operational activities may result in direct effects on valley elderberry longhorn beetle through the removal or partial destruction of elderberry shrubs within the project action area. Permanent installation of impermeable surfaces (e.g. concrete) may alter site hydrology (e.g. alterations in water flow patterns, inundation patterns, ground water, or water quality), which can negatively affect plant survival and result in subsequent loss of habitat for the valley elderberry longhorn beetle. Valley elderberry longhorn beetles mortality may occur from collisions or crushing by vehicles, equipment, human destruction or disturbance of occupied elderberry shrubs, or destruction of native riparian habitat

Table 10. Summary of proposed compensation for permanent effects to suitable habitat for the Valley elderberry longhorn beetle.[a]

Stem Size Class (maximum diameter at ground level, in inches)	Exit Holes on Shrub [b]	Elderberry Seedling/ Cutting Ratio [c]	Associated Native Plant Ratio [d]
Riparian Habitat			
Stems 1 to 3	Yes	1:01	1:01
	No	2:01	2:01
Stems 3 to 5	Yes	2:01	1:01
	No	4:01	2:01
Stems > 5	Yes	3:01	1:01
	No	6:01	2:01
Non-Riparian Habitat			
Stems 1 to 3	Yes	2:01	1:01
	No	4:01	2:01
Stems 3 to 5	Yes	3:01	1:01
	No	6:01	2:01
Stems > 5	Yes	4:01	1:01
	No	8:01	2:01

[a] Compensation was determined following the guidelines in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Service 1999a).

[b] All stems measuring at least 1inch in diameter at ground level on a single shrub are considered occupied when exit holes are present anywhere on the shrub.

[c] Ratios in the *Elderberry Seedling Ratio* column correspond to the number of cuttings or seedlings to be planted per elderberry stem (at least 1 inch in diameter at ground level) affected by the proposed project.

[d] Ratios in the *Associated Native Plant Ratio* column correspond to the number of associated native species to be planted per elderberry (seedling or cutting) planted.

Implementation of the proposed conservation measures will significantly reduce adverse effects to the valley elderberry longhorn beetle during project construction, maintenance, and operations. All disturbed areas will be restored and revegetated with native plants and seeds following construction under the guidance of the RRP. The Authority will follow compensatory mitigation measures provided within the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Table 10) (Service 1999a). The Authority has proposed to implement compensatory mitigation for this species at one or two permittee-responsible mitigation sites identified in the July 2012 Draft MSIP. These sites, located within Merced, Madera, and Fresno counties, will be acquired, protected in perpetuity through conservation easements, protected and managed for the conservation of valley elderberry longhorn beetle, and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Implementation of these mitigation measures and proposed revegetation of disturbed areas will enhance and protect habitat that will support the survival and recovery of the valley elderberry longhorn beetle.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Habitat loss, fragmentation, as a result of increased agriculture, development, and urbanization pose the greatest conservation threats to the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover. The Service does not have specific information regarding future non-federal actions within the project action area. However, increased agriculture, urbanization, and human development is reasonably likely to result in increased loss of habitat and a reduction in available food resources to support these species.

Encroachment from residential developments and infrastructure to support increased population expansion could result in further habitat loss and fragmentation for the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover.

Conclusion

San Joaquin kit fox

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of San Joaquin kit fox from the proposed project. However, after reviewing the current status of the San Joaquin kit fox the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of this listed species because the FRA and Authority has proposed to install dedicated wildlife crossings and other structures to maintain current levels of connectivity among populations of this species, the amount of anticipated take will occur primarily in compatible-use agricultural lands. Protection of habitats within the permittee-responsible mitigation sites as identified in the July 2012 Draft MSIP would preserve and restore suitable habitat for the San Joaquin kit fox. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Central California tiger salamander, conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and valley elderberry longhorn beetle

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of central California tiger salamander, conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and valley elderberry longhorn beetle from the proposed project. However, after reviewing the current status of the central California tiger salamander, conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and valley elderberry longhorn beetle the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of these listed species because the amount of anticipated take is of such a limited scale, relative to the status of these species in and around the action area and range-wide. Protection of habitats within the permittee-responsible mitigation sites identified in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed wildlife species. Permanent protection of these lands through conservation easements will provide beneficial effects for these species and contribute to their survival and recovery.

Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, succulent owl's-clover

After reviewing the current status of the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, and the succulent owl's-clover, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of these listed species because only a very small proportion of habitat for them will be permanently lost as a result of the project, relative to the status of the species in and around the action area and range-wide. However, even with the implementation of the proposed Conservation Measures, the Service still believes that there will be adverse effects to the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the succulent owl's-clover. Protection of habitats within the permittee-responsible mitigation sites identified in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno

Section, and permanently protect designated critical habitat for two of the listed plant species. Permanent protection of these lands through conservation easements will provide beneficial effects for these species and contribute to their survival and recovery.

INCIDENTAL TAKE STATEMENT

As noted earlier, the FRA and the Authority have clarified that at this point in time, they are planning to implement the Project in phases, with Phase 1 being a specific portion of the CHST-MF segment. This portion includes the Fresno station of the segment, and runs northwest to Avenue 17, just to the north and east of Madera as depicted in Figure 1, above. While this Biological Opinion analyzed the effects to listed species for the entire segment, and concluded that implementation of the Project as proposed was not likely to jeopardize the continued existence of any of the listed species considered herein, this Incidental Take Statement provides exemptions to the prohibitions of section 9 of the Act only for the specific portion of the Project identified as Phase 1. Subsequent phases of the CHST-MF segment Project will not be exempted from the prohibitions of section 9 until such time as the Service issues a revised Incidental Take Statement that for each of these phases, including the operational phase.

When the FRA and Authority are prepared to implement subsequent phases of the Project, they must first informally consult with the Service to demonstrate that the project description, as proposed and described in this Biological Opinion, has not been subsequently modified in a manner that would cause an effect to listed species or critical habitat that was not considered in this Biological Opinion. If the proposed phase being evaluated meets this condition, and none of the other reinitiation criteria set forth in 50 CFR 402.16 (see Reinitiation - Closing Statement below) have been triggered, the Service may revise this Incidental Take Statement to include the proposed phase. Should the proposed phase include a modification to the action that would cause an effect not previously considered, or should any of the reinitiation criteria be triggered, the FRA and Authority must reinitiate formal section 7 consultation with the Service prior to moving forward with the proposed phase.

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the FRA so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The FRA has a continuing duty to regulate the activity covered by this incidental take statement. If the FRA: (1) fails to assume and implement the terms and conditions or (2) fails to require the Authority, and all of its contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of the incidental take the FRA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law. The hairy Orcutt grass and the Greene's tuctoria are all listed under the California Endangered Species Act (CESA) (California Fish and Game Code, section 2080 et seq.). The CESA prohibits the unauthorized take of State-listed threatened or endangered species. The Native Plant Protection Act (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities.

Amount or Extent of Take

San Joaquin kit fox

It is not possible to quantify the number of individual San Joaquin kit fox that will be taken as a result of Phase 1 of the proposed project because of their nocturnal behavior, the species is highly motile and usually maintain large home ranges (average estimated in Merced County = 1,169 acres), and the number of individuals with home ranges that overlap with project action area is unknown. Therefore, the amount of habitat for this species that will be impacted as a result of Phase 1 of the CHST-MF Project will be used as a surrogate for quantifying take. The Service anticipates that all San Joaquin kit foxes inhabiting 3,624 acres of will be subject to incidental take in the form of harassment as construction activities progress for Phase 1. In addition, the Service anticipates that up to 324 acres of suitable habitat will be directly impacted and permanently lost as a result of Phase 1 of the CHST-MF Project resulting in harm to the species by significantly impairing essential behaviors, including breeding foraging, and denning. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the

CHST-MF Project in the form of harm and harassment of the San Joaquin kit fox caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Central California tiger salamander

It is not possible to quantify the number of individual central California tiger salamanders that will be impacted as a result of Phase 1 of the CHST-MF the proposed project. Specifically, when central California tiger salamanders are not in their breeding ponds, they inhabit the burrows of ground squirrels or other rodents or may be moving from one location to another, and may be difficult to locate due to their cryptic appearance and behavior; they may be located a distance from the breeding ponds; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Loss of these species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the amount of habitat for this species impacted by the project will be used as a surrogate for quantifying take. The Service anticipates that 9.21 acres of suitable aquatic breeding habitat and 102.55 acres of suitable upland habitat for the central California tiger salamander will be permanently lost as a result of Phase 1 of the CHST-MF Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-MF Project in the form of harm, harassment, capture, injury, and death of the central California tiger salamander caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp

It is not possible to quantify the number of individual conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp that will be taken as a result of the proposed project. Specifically, the finding of an injured or dead conservancy fairy shrimp, vernal pool fairy shrimp, or vernal pool tadpole shrimp is unlikely because of their extremely small body size. Loss of these species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their vernal pool habitat, or additional environmental disturbances. Therefore, the quantity of acres of habitat for this species impacted by the project will be used as a surrogate for quantifying take. The Service anticipates that all conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp inhabiting vernal pool and seasonal wetland habitat within the project footprint, and within 250 feet of the project footprint will be subject to incidental take in the form of harm. The Service anticipates that 6.15 acres of vernal pool habitat suitable for the conservancy fairy shrimp will be lost. A 5.78-acre subset of the above 6.15-acres of vernal pool habitat suitable for the vernal pool fairy shrimp, and the vernal pool tadpole shrimp will be permanently lost as a result of Phase 1 of the CHST-MF Project. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-MF Project of the conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Valley elderberry longhorn beetle

It is not possible to quantify the number of individual Valley elderberry longhorn beetles will be taken as a result of the proposed project. Specifically, the finding of an injured or dead Valley elderberry longhorn beetle is unlikely because of their extremely small body size, ecology, and behavior. Therefore, the amount of acres of habitat for this species that will be impacted will be used as a surrogate for quantifying take. Therefore, the Service anticipates that all Valley elderberry longhorn beetles inhabiting elderberry shrubs within suitable habitat comprising the project action area for Phase 1will be subject to incidental take in the form of harm and harassment. The Service anticipates that 1.17 acres of suitable riparian habitat that supports elderberry shrubs for the Valley elderberry longhorn beetle will be permanently lost as a result of Phase 1 of CHST-MF Project. However, it is not known how much of the habitat subject to direct or indirect effects actually contain elderberry shrubs that would support valley elderberry longhorn beetle. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the CHST-MF Project in the form of harm and death of the Valley elderberry longhorn beetle caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service has determined this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, and the valley elderberry longhorn beetle.

Reasonable and Prudent Measure

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize the effects of the CHST-MF Project on the San Joaquin kit fox, the central California tiger salamander, the conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, the valley elderberry longhorn beetle:

All of the conservation measures as proposed by the FRA and the Authority in the biological assessment, and restated in the project description section of this biological opinion, must be fully implemented and adhered to.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FRA must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The FRA shall ensure that the Authority and all of its contractors fully implement and adhere to the proposed conservation measures. All terms and conditions that apply to contractor activities shall be conditioned in contracts for the work.

2. In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the FRA shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the FRA must immediately reinitiate formal consultation as per 50 CFR 402.16.

   a. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the FRA shall provide weekly updates to the Service with a precise accounting of the total acreage when the following habitats are impacted: (1) natural grasslands (Table 6); (2) compatible-use agricultural lands (Table 6); (3) upland habitat for the California tiger salamander (Table 7); (4) vernal pool habitat for vernal pool species (Tables 8 to 9); (5) riparian for the valley elderberry longhorn beetle; and (6) actual number of elderberry shrubs and stems for the valley elderberry longhorn beetle (Table 10). Updates shall also include any information about changes in project implementation that result in habitat disturbance not described in the *Description of the Proposed Action* and not analyzed in this biological opinion.

   b. For those components of the action that may result in direct encounters between listed species and project workers and their equipment whereby incidental take in the form of harassment, harm, injury, or death is anticipated, the FRA shall immediately contact the Service's SFWO at (916) 414-6600, to report the encounter. If an encounter occurs after normal working hours, the FRA shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the FRA shall follow the steps outlined in the *Salvage and Disposition of Individuals* section.

   c. A post-construction report detailing compliance with the project design criteria and proposed conservation measures described under the *Description of the Proposed Action* section of this biological opinion shall be provided to the Service within 30 calendar days of completion of the project. The report shall include: (1) dates of project groundbreaking and completion; (2) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (3) an explanation of failure to meet such measures, if any; (4) known project effects listed species, if any; (5) observed incidences of injury to or mortality of any listed species, if any; and, (6) any other pertinent information.

   d. New sightings of any listed species shall be reported to the CNDDB. A copy of the reporting form and a topographic map clearly marked with the location in which the animals were observed also shall be provided to the Service.

3. The FRA will submit a final Mitigation Strategy and Implementation Plan to the Service prior to initiation of construction of the CHST-MF Project. In addition, prior to commencement of construction for any phase, the Authority will provide a phase specific final mitigation plan that implements mitigation consistent with the MSIP, and identifies long term management measures, appropriate conservation instruments , appropriate financial assurances (e.g., proof of credit purchase from Service-approved conservation banks) to the

Service for each phase of construction. The Authority will also submit all proposed conservation easements or similar instruments, management plans, and financial assurances to the Service for review and approval prior to initiation of construction activities.

4. The FRA shall follow all compensatory mitigation measures provided within the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Table 10).

5. The FRA shall require the use of appropriate California native species in vegetation and habitat enhancement efforts.

Salvage and Disposition of Individuals

In the case of an injured and/or dead San Joaquin kit fox or central California tiger salamander, the Service shall be notified of events within one day and the animal shall only be handled by a Service-approved biologist. Injured San Joaquin kit foxes or central California tiger salamanders shall be cared for by a licensed veterinarian or other qualified person. In the case of a dead San Joaquin kit fox or central California tiger salamander, the animal shall be preserved, as appropriate, and shall be bagged and labeled (i.e. species type; who found or reported the incident; when the report was made; when and where the incident occurred; and if possible, cause of death). Carcasses shall be held in a secure location, such as a freezer or cooler, until instructions are received from the Service regarding the disposition of the specimen or until the Service, or another appropriate agency or qualified person, takes custody of the specimen. The FRA must report to the Service within one calendar day any information about take or suspected take of federally-listed species not exempted in this opinion. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. The Service contacts are Daniel Russell, Deputy Assistant Field Supervisor, Endangered Species Program, Sacramento, at (916) 414-6600 and the Service's Law Enforcement Division at (916) 414-6660. Any contractor or employee who, during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to his representative at his contracting/employment firm and to the FRA. This representative must contact the Service within one calendar day.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Service recommends the Authority develop and implement the appropriate restoration measures in areas designated in the *Valley Elderberry Longhorn Beetle Recovery Plan* (Service 1984), *Recovery plan for upland species of the San Joaquin Valley, California* (Service 1998), and the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005c).

2. The FRA and Authority should incorporate "environmentally friendly" erosion and stabilization techniques whenever possible in this project, such as use of biodegradable materials constructed from natural fibers (e.g. coconut fiber).

3. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFG. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the CHST-MF Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

As discussed in the Incidental Take Statement above, the FRA and the Authority have clarified that at this point in time, they are planning to implement the Project in phases, with Phase 1 being a specific portion of the CHST-MF segment. This portion includes the Fresno station of the segment, and runs northwest to Avenue 17, just to the north and east of Madera as depicted in Figure 1, above. While this Biological Opinion analyzed the effects to listed species for the entire segment, and concluded that implementation of the Project as proposed was not likely to jeopardize the continued existence of any of the listed species considered herein, this Incidental Take Statement provides exemptions to the prohibitions of section 9 of the Act only for the specific portion of the Project identified as Phase 1. Subsequent phases of the CHST-MF segment Project will not be exempted from the prohibitions of section 9 until such time as the Service issues a revised Incidental Take Statement that for each of these phases, including the operational phase.

When the FRA and Authority are prepared to implement subsequent phases of the Project, they must first informally consult with the Service to demonstrate that the project description, as proposed and described in this Biological Opinion, has not been subsequently modified in a manner that would cause an effect to listed species or critical habitat that was not considered in this Biological Opinion. If the proposed phase being evaluated meets this condition, and none of the other reinitiation criteria set forth in 50 CFR 402.16 (see Reinitiation - Closing Statement below) have been triggered, the Service may revise this Incidental Take Statement to include the proposed phase. Should the proposed phase include a modification to the action that would cause an effect not previously considered, or should any of the reinitiation criteria be triggered, the FRA and Authority must reinitiate formal section 7 consultation with the Service prior to moving forward with the proposed phase.

If you have any questions, please contact Florence Gardipee, Fish and Wildlife Biologist, or Daniel Russell, Deputy Assistant Field Supervisor, of this office at (916) 414-6600, or by email (Flo_Gardipee@fws.gov).

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Mark McLoughlin, Sacramento, California High Speed Rail Authority
Julie Vance, California Department of Fish and Game, Bakersfield, California
Enrique Manzanilla, Environmental Protection Agency, San Francisco, California
Jane M. Hicks, U.S. Army Corps of Engineers, San Francisco, California

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National Marine Fisheries Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

April 17, 2012

In Response, refer to:
2011/05794

David Valenstein
Chief, Environment & Systems Planning Division
U.S. Department of Transportation
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Mr. Valenstein:

Enclosed is NOAA's National Marine Fisheries Service's (NMFS) conference and biological opinion (BO) (Enclosure 1) based on the Service's review of the proposed California High-Speed Train (HST) System for the Merced to Fresno section located in Merced, Madera and Fresno counties of California, and its effects on Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and California Central Valley (CCV) steelhead (*O. mykiss*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your initial request for formal section 7 consultation on this project was received on November 30, 2011. On December 1, 2011, formal consultation was initiated by NMFS' Central Valley Office.

This BO is based on information provided in the biological assessment (BA) for the Merced to Fresno section provided on November 30, 2011, the draft Environmental Impact Statement, the Biological Resources and Wetlands Technical Report for the Merced to Fresno section provided on August 25, 2011, and the technical memorandum that refines the San Joaquin bridge crossing portion of the BA received by NMFS December 12, 2011. Due to the San Joaquin River Restoration Program (SJRRP) and its mandate to have an experimental designated population of CV spring-run Chinook salmon below Friant Dam near Fresno, California no later than December 31, 2012, as part of the NRDC, *et al.*, v. Kirk Rodgers, *et al.* 2006 settlement agreement, this will also serve as a conference opinion for that species as well as a BO for the CCV steelhead.

Based on the best available scientific and commercial information, the BO concludes that the HST, as presented by the Federal Railroad Administration, is not likely to jeopardize the continued existence of the listed species. NMFS anticipates that the proposed project will result in the incidental take of CCV steelhead and CV spring-run Chinook salmon. An incidental take statement that includes reasonable and prudent measures and non-discretionary terms and conditions that are expected to minimize the impact of the anticipated incidental take of CV steelhead and CV spring-run Chinook is included with the BO.

This letter also transmits NMFS' Essential Fish Habitat (EFH) conservation recommendations for Pacific salmon as required by the Magnuson-Stevens Fishery Conservation and Management Act as amended (16 U.S.C. 1801 *et seq.*; Enclosure 2). The document concludes that the HST Merced to Fresno section will adversely affect the EFH of Pacific salmon in the action area and adopts certain terms and conditions of the incidental take statement and the ESA conservation recommendations of the biological opinion as the EFH conservation recommendations.

Please contact Sierra Franks at our Central Valley Office at (916) 930-3720, or via e-mail at Sierra.Franks@noaa.gov, if you have any questions regarding this response or require additional information.

Sincerely,

FOR

Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: NMFS-PRD, Long Beach, CA
Dan Russell, USFWS, Sacramento, CA
Dan Leavitt, California High Speed Rail Authority, Sacramento, CA
Copy to Administrative File: 151422SWR2011SA00573

Enclosure 1

BIOLOGICAL and CONFERENCE OPINION

ACTION AGENCY: Federal Railroad Administration & California High Speed Rail Authority

ACTION: High Speed Train: Merced - Fresno

CONSULTATION CONDUCTED BY: Southwest Region, National Marine Fisheries Service

FILE NUMBER: 151422SWR2011SA00573 (TN/2011/05794)

DATE ISSUED: **April 17, 2012**

I. CONSULTATION HISTORY

The U.S. Department of Transportation Federal Railroad Administration (FRA) along with the California High-Speed Rail Authority (HSRA) is proposing to construct the Merced to Fresno section of the California High-Speed Train (HST) in Merced, Madera and Fresno counties in California. The HST Merced to Fresno section is one section in a total of ten that will create a state-wide high speed rail infrastructure, connecting major metropolitan areas such as Los Angeles, San Francisco and Sacramento. The Merced to Fresno section will consist of approximately 80 miles of track, 2 railroad passenger stations, approximately 42 road overcrossings and undercrossing, associated railway support facilities, and will allow the HSR to travel at speeds up to 220 miles per hour.

On September 23, 2009, the HSRA requested technical assistance regarding potential effects from the Merced to Fresno section on special-status anadromous fish pursuant to section 7 of the ESA, as well as the effects on Essential Fish Habitat (EFH) of the Magnuson-Stevens Act (MSA).

On January 5, 2010, the HSRA met with the National Marine Fisheries Service (NMFS) to discuss the project. At this meeting it was determined that additional information should be gathered before determining if the proposed actions could affect special-status fish. It was also initially determined that California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) and Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) may need to be analyzed for potential effects.

On November 17, 2010, the HSRA requested a species list from NMFS. On February 1, 2011, a species letter was sent from NMFS indicating that at the time construction begins on the HST the San Joaquin River Restoration Program will have been implemented and the HST should consider its effects on CCV steelhead and CV spring-run Chinook salmon as well as EFH for CV spring-run Chinook salmon.

On March 14, 2011, the FRA sent a memorandum of understanding to NMFS and USFWS designating the HSRA to act on behalf of the FRA as a non-federal representative.

On June 14, 2011, an agency coordination meeting took place with representatives from the HSRA, NMFS, the United States Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG) and the U.S. Environmental Protection Agency (EPA) to discuss the approach for the BA and the anticipated timeframe.

On August 25, 2011, NMFS received a draft EIR/EIS and a Biological Resources and Technical Report.

On September 2, 2011, a meeting with NMFS, USFWS and the HSRA took place to address the draft Biological Resources and Wetlands Technical report and the BA approach and schedule.

On October 17, 2011, NMFS received a draft BA for the Merced to Fresno section.

On October 27, 2011, a meeting with the HSRA, NMFS and USFWS occurred to discuss findings and issues with the draft BA.

On October 31, 2011, consultants with AECOM under direction from the HSRA met with NMFS to discuss details about the bridge crossing over the San Joaquin River.

On November 22, 2011, a meeting with HSRA, NMFS, CDFG, EPA, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation (BOR), California Department of Water Resources (CDWR), and consultants from AECOM, CH2M Hill, Parsons Brinckerhoff and URS met to discuss mitigation measures for the proposed high speed rail for the sections of Merced to Fresno and Fresno to Bakersfield.

On November 30, 2011, NMFS, USFWS, CDFG, CDWR and BOR met with the HSRA to discuss modifications to the bridge crossing over the San Joaquin River from its current proposal in the BA. That same day a BA package for the Merced to Fresno section was delivered in person to NMFS initiating formal consultation.

On December 7, 2011, the HSRA, NMFS, USFWS and consultants from AECOM and URS met to discuss the Services initial review of the BA.

On December 12, 2011, NMFS received a memorandum to the BA regarding the San Joaquin River Crossing Design Refinement – Merced to Fresno section.

On December 20, 2011, NMFS asked for additional clarification on a few details regarding the bridge crossing over the San Joaquin River. On December 30, 2011, a consultant from AECOM working with the FRA/HSRA replied to these questions via e-mail.

On January 10, 2012, additional information was requested by NMFS regarding temporary bridge support work.

On January 12, 2012, a meeting with representatives with AECOM was held at the NMFS office to discuss temporary bridge support work.

On February 8, 2012, a meeting with CDFG, USFWS, HSR consultants and NMFS occurred to discuss pertinent questions from agencies.

On March 2, 2012, a meeting with CDFG, USFWS, HSRA and NMFS occurred to discuss how the BO was progressing.

On March 5, 2012, the bi-monthly federal family meeting involving NMFS, USFWS, Army Core of Engineers, Environmental Protection Agency, Bureau of Reclamation, and Department of Transportation occurred to discuss any questions that may be relevant to all agencies.

On March 29, 2012, AECOM a contractor for the HSRA, provided specific latitude and longitude coordinates for the San Joaquin bridge crossing that were requested by NMFS.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Construction Activities

The FRA in conjunction with the HSRA is proposing to build a high speed train system in California that will connect major metropolitan hubs, and other large cities of the central valley that have limited connectivity currently. The final project will consist of ten separate sections, that can function independently, but joined together will create a large state-wide HST system. This BO addresses one section, the Merced to Fresno section, located in Merced, Madera and Fresno counties, California. The proposed HST involves constructing an electrically powered, steel-wheel-on-steel rail system with the state -of-the-art safety, signaling, and automated train-control systems. The HST would be capable of operating at speeds up to 220 miles per hour over fully grade-separated, dedicated track alignment. A portion of this section is a large span bridge crossing over the San Joaquin River near the city of Fresno, California. The proposed HST bridge will be upstream and parallel to the existing highway 99 bridge and BNSF/UPRR Railroad Bridge. This consultation package is for a 15 percent design-build plan of the Merced to Fresno section, including the San Joaquin River Bridge crossing.

The soffit, or lowest portion of the structure spanning the waterway, would be a minimum of 10 to 15 feet above the top bank on both sides of the river, providing ample passage for flood flows and wildlife. The section of the elevated structure or guideway that crosses the San Joaquin River is anticipated to be supported on foundations consisting of cast-in-drilled-hole (CIDH) with cast-in-place concrete column extensions. The preliminary design submitted with the BA depicts the use of two basic foundations; a single large [12-14 feet] diameter CIDH pile with a reinforced concrete column extension and a reinforced concrete footing supported by 4 or more 8' diameter CIDH piles.

The estimated acreage affected is equal to the column cross-section area above the finished grade. A reasonable preliminary estimate for the area of the CIDH/Column extension is between 75-125 square feet (sf), depending on the diameter used. A larger column would be required to support the ends of the long spans, with probable cross-sectional areas varying between 300-500 sf, depending on the configuration of the structure type. The concept described in the memorandum to the BA regarding the San Joaquin River Crossing Design Refinement – Merced to Fresno section would result in less than .05 acres of permanent effect.

Temporary false work is anticipated to contain approximately 35 to 40 two foot diameter steel pipes. These pipes will be placed at least 50 feet apart from each other across the river channel. These pipes will be placed no more than 50 feet in width from the centerline of the proposed bridge, as this is the current Right of Way. This anticipates that approximately 5 to 8 pipes will be required for one temporary support structure. Temporary supports will be placed using a vibratory hammer and will be put in during one in-water work window season and removed the next window (June 1 – October 15). Temporary supports will be placed to withstand winter flows and contracted employees may be required to enter the stream bed to assist in guiding the pipes in place.

Currently, the UPRR railway and the Caltrans SR 99 bridge structures downstream from the feature crossing have piers in the San Joaquin River corridor that are spaced approximately 160 feet apart. The HST bridge design uses a combination of the typical precast segmental construction at each approach to the crossing and then spans the main flow channel with a 160 to 320-foot steel truss superstructure to minimize the need to enter the wetted perimeter of the low-flow river channel.

Where required, the construction of foundations within the edge of the active waterway would use construction methods such as installation of sheet pile cofferdams to isolate the activity from the live stream in order to avoid or minimize the potential for adverse effects on listed fish within the action area. In addition, both temporary and permanent steel casings for cast-in-drilled-hole pile construction and piling for falsework will use a vibratory hammer for installation, which will minimize underwater sound pressures.

The number of foundation elements is directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Since the future crossing will be located upstream of the two existing bridge structures, the hydraulic effect of the placement of the new piers within the river corridor on downstream structures and the geomorphology of the channel will be considered during the final configuration of the structure. Refer to figure 1 for further clarification.

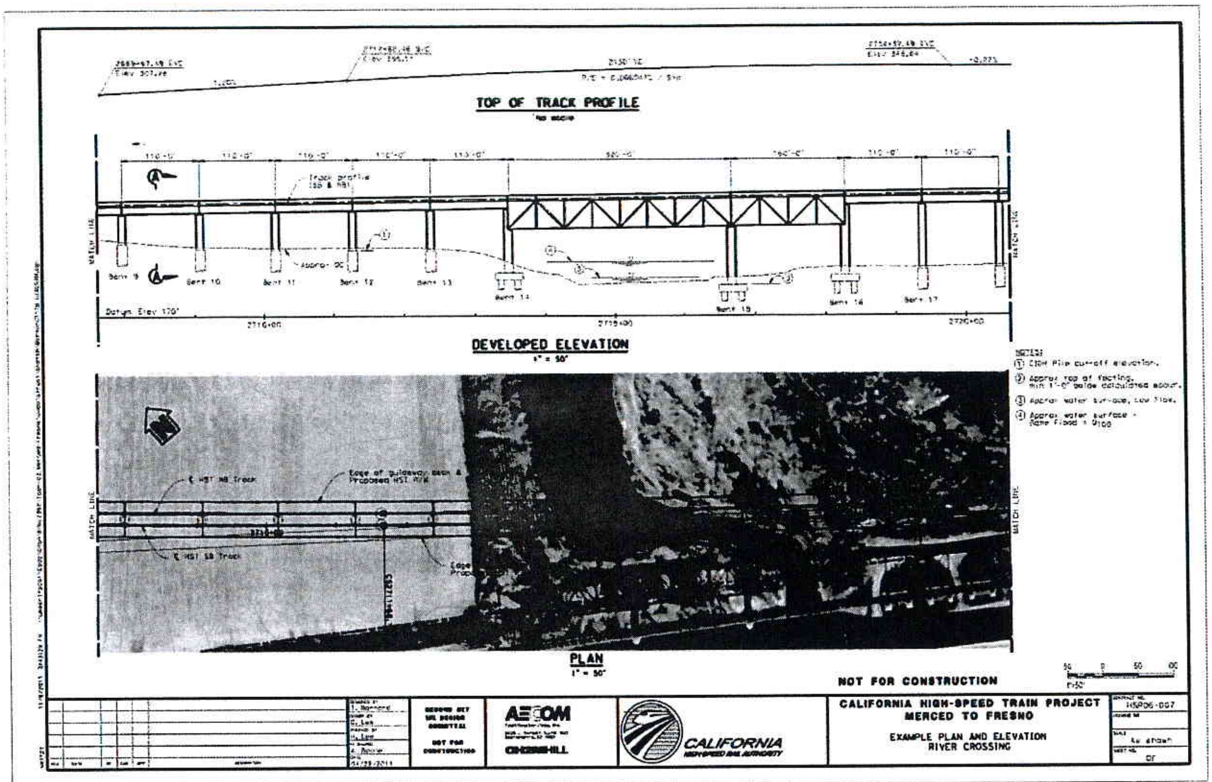


Figure 1. A cross-section and topographic view of pier placements across the San Joaquin River

Additionally periodic maintenance of the piers will need to be done. The typical periodic underwater inspections of bridge foundations are performed on a 60 month cycle. They are usually performed by the owners engineering inspection personnel that have the appropriate certifications for diving in the water depths involved. Owners like the HSRA may hire outside consultants with the appropriate qualifications to perform these tasks.

During construction a qualified fisheries biologist with experience in snorkel surveys and salmonid identification will be conducting fish presence surveys immediately prior to any in-water work (*e.g.*, installation of temporary sheet piles to isolate work area) and surveys will be conducted again if there is a multi-day pause or lapse in construction activities.

It will take approximately two seasons of near-water or at times in-water work (depending on flow) and an additional two seasons of construction for upland piers and bridge deck, for a total of four seasons of bridge work. The proposed HST project is expected to begin in fall of 2013 with the first season of in-stream work occurring in summer of 2014.

B. Action Area

Action area is defined as areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the action area consists of two components. The *terrestrial* component of the action area is defined by: 1) the project footprint, including all cleared areas, and staging areas; and 2) construction noise levels in excess of ambient conditions. The *aquatic* component of the action area is defined by: (1) the segment of the San Joaquin River 400 feet upstream and downstream of bridge construction sites where pile driving sound noise levels are expected to exceed ambient conditions; (2) construction-related water quality impacts in excess of ambient conditions; and (3) operational storm water quality impacts in excess of ambient conditions.

The proposed HST bridge is located just north of the city of Fresno, California at a latitude of 36°50'38.14"N and a longitude of 119°55'56.92"W. The HST guideway would be elevated from approximately 1,000 to 1,500 feet north of the north bank of the San Joaquin River to just north of Veterans Boulevard (in Fresno), a distance of between 9,000 and 12,000 feet. The project area has two distinct environmental settings. The first setting is where the new bridge will be located, which is within the confines of the San Joaquin river channel. The second environmental setting is outside the river channel and includes mostly agricultural type lands.

The topography in the project area ranges from 160 feet near downtown Merced to 300 feet north of downtown Fresno. The topography is mainly flat with slopes ranging from 0 to 2 percent. The Mediterranean climate of the San Joaquin Valley is characterized by hot, dry summers, and cool, wet winters.

Landform groups are a mixture of recent alluvial fans and floodplains, older, low alluvial terraces, basin areas (including saline-alkali basins), high terrace, and hydric soils.
The action area lies in the southern portion of the San Joaquin River Basin. The basin encompasses about 13,500 square miles and includes large areas of high elevation along the western slope of the Sierra Nevada. As a result the San Joaquin River experiences significant snowmelt runoff during the late spring and early summer. Flood flows typically occur between April and June.

The Merced to Fresno section is located in three watershed sub basins: the Middle San Joaquin-Lower Chowchilla, Fresno River, and Upper Dry. Most of the action area is located to the north of the San Joaquin River in the middle San Joaquin –Lower Chowchilla Watershed (Hydrologic Unit Code 18040001). The action area to the south of the San Joaquin River is located in the Tulare-Buena Vista Lakes Watershed (Hydrologic Unit Code 18030012). Prominent water features in the action area include Bear Creek, Miles Creek, Owens Creek, Duck Slough, Deadman Creek, Dutchman Creek, the Chowchilla River, Ash Slough, Brenda Slough, Brenda Creek, the Fresno River, Cottonwood Creek, and the San Joaquin River. The natural hydrology of the region has been substantially altered by the construction of dams, storage reservoirs, diversion dams, canals, and groundwater pumping associated primarily with agricultural irrigation.

C. Proposed Conservation Measures

The following conservation measures have been incorporated into the project design by the FRA/HSRA to avoid and/or minimize potential adverse effects of the proposed HSR project on special status fish species.

1. There will be a construction work window of June 15 – October 15. This time period will minimize impacts on migrating juvenile and adult CCV steelhead and CV spring-run Chinook salmon.

2. Pre-construction fish surveys (snorkel surveys following CDFG Salmonid Restoration Manual techniques) conducted by qualified fisheries biologist to determine the presence and/or density of salmonids utilizing the Resource Study Area (RSA).

3. Contractor education and environmental training about salmonid biology (life history and habitat requirements) and using best management practices (BMPs) as described below to minimize potential impacts on water quality and/or fish habitat.

4. Biological monitoring during construction activities.

5. Use of environmentally sensitive areas and environmentally restricted areas to protect Essential Fish Habitat.

6. Restoration of temporarily disturbed areas upon project completion.

7. Temporary construction sites, including staging areas, lay down and storage areas for equipment, materials, and construction vehicles, parking areas, and incidental stockpiling areas, will be assigned, as feasible, on the north side of the San Joaquin River in areas that do not include sensitive habitat for listed species or that affect riparian vegetation. These temporary construction sites may include areas that are within agriculture, pasture, barren or otherwise disturbed vegetation.

8. Work within the area of the designated floodway will be limited to the period from April 15 to October 31 for flood protection issues, unless otherwise authorized by the Central Valley Flood Protection Board.

9. Develop and implement a Storm Water Pollution Prevention Plan (SWPPP). Temporary construction BMPs will be implemented in accordance with the Merced to Fresno section plans and specifications, as well as the approved SWPPP. BMPs may include, but would not be limited to, silt fences, fiber rolls, straw bales, sandbag barriers, check dams, and sediment basins.

10. Pile Driving Underwater Sound Pressure Measures. The following measures will be implemented to avoid and minimize potential adverse effects that could otherwise result from in-water pile-driving activities:

    - The contractor will develop a plan for pile-driving activities in water to minimize impacts on fish and will allow sufficient time in the schedule for coordination with regulatory agencies. Measures will be implemented to minimize underwater sound pressures to levels below thresholds for peak pressure and accumulated sound exposure levels. Threshold levels established by NMFS that will not be exceeded are as follows:

- Peak Pressure = 206 dB
- Accumulated sound exposure levels = 183 dB

- Underwater sound monitoring will be performed during pile-driving activities. A qualified biologist or natural resource specialist will be present during such work to monitor construction activities and compliance with terms and conditions of permits.

- Sheet piling will be driven by vibratory or nonimpact methods (*i.e.* hydraulic) that result in sound pressures below threshold levels to the extent feasible.

- Pile driving will be conducted only during daylight hours and initially will be used at low energy levels and reduced impact frequency. Applied energy and frequency will be gradually increased until necessary full force and frequency are achieved.

11. Implement Fish Rescue Plan Inside Cofferdam. Installation of the cofferdam and dewatering on the site during construction could result in fish stranding. The contractor will develop and implement a fish rescue plan acceptable to the CDFG, USFWS, and NMFS.

    - The contractor will ensure that a qualified fisheries biologist with a current CDFG collection permit conducts the fish rescue and relocation efforts behind the cofferdam. The fish rescue effort will be implemented during the dewatering of the areas behind the cofferdam(s) and involve capture and return of those fish to suitable habitat within the adjacent waterways. The area will first be seined, followed by electrofishing to remove fish that are behind the cofferdam. A fisheries biologist will be on-site during initial pumping (dewatering) to ensure compliance with the plan.

    - The contractor will monitor the progress of dewatering and allow for the fish rescue to occur prior to completely closing the cofferdam and again when water depths reach approximately 2 feet. USFWS, NMFS, and CDFG will be notified at least 48 hours prior to the start of fish rescue efforts. Information on the species, number, and sizes of fish collected would be recorded during the fish rescue and provided in a letter report to be submitted within 30 days after the fish rescue to USFWS, NMFS, and CDFG.

    - The Fish Rescue Plan will contain methods for minimizing the risk of stress and mortality due to capture and handling of fish removed from the construction site and returned to adjacent waterways.

    - Implementation of the Fish Rescue Plan would minimize potential adverse effects to listed fish species (if present) associated with fish stranding during dewatering activities related to the construction activities.

- The Design-Build team will work systematically with NMFS to establish design hydrology and demonstrate minimal hydraulic impacts from design.

- The San Joaquin Bridge crossing will be designed with the planned increase in flow due to the SJRRP and will maintain or effectively minimize any appreciable changes in scour, sediment transport, deposition, or changes in geomorphic process that could alter habitat conditions in a manner that would impede the reestablishment of CV spring-run Chinook salmon.

- The HSRA along with the Design-Build team will present a final San Joaquin Crossing Plan prior to any site preparation or mobilization of work on or near the San Joaquin River. If final design refinements are deemed to be substantial changes from the original product description, ESA section 7 consultation will be reinitiated.

- Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complemented with native riparian plantings or other natural stabilization alternatives that would restore and maintain a natural riparian corridor, where feasible.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

The following federally listed species evolutionarily significant units (ESU) or distinct population segments (DPS) occur or are proposed to occur in the action area and may be affected by the proposed project:

Central Valley spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)
Threatened (August 15, 2011, 76 FR 157)
California Central Valley steelhead DPS (*Oncorhynchus mykiss*)
Threatened (August 15, 2011, 76 FR 157)

A. Species and Critical Habitat Listing Status

In 2011, NMFS completed an updated status review of five salmon ESUs and one DPS of steelhead, including CV spring-run Chinook salmon and California Central Valley Steelhead, and concluded that the species' status should remain as previously listed (June 28, 2005, 70 FR 37160, 2006 71 FR 834). The new listing concludes that CCV steelhead and CV spring-run Chinook salmon will remain listed as threatened.

1. <u>CV spring-run Chinook salmon</u>

NMFS first listed the CV spring-run Chinook salmon ESU as threatened on September 16, 1999 (64 FR 50394). In August 2011, NMFS proposed that CV spring-run Chinook salmon remain listed as threatened (76 FR 157). This proposal was based on the recognition that the ESU continues to face risks from having a limited number of remaining populations (*i.e.*, 3 existing independent populations from an estimated 17 historical populations), a limited geographic distribution, and potential hybridization with Feather River Hatchery (FRH) spring-run Chinook salmon, which until recently were not included in the ESU and are genetically divergent from other populations in Mill, Deer, and Butte creeks. On August 15, 2011, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of CV spring-run Chinook salmon as threatened (76 FR 157). Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). Designated critical habitat includes approximately 8,935 net miles (mi) of riverine habitat and 470 mi^2 of estuarine habitat (primarily in San Francisco-San Pablo-Suisun Bays) in California (70 FR 52488). The upper San Joaquin River is not designated critical habitat for CV spring-run Chinook salmon at this time.

2. CCV steelhead

CCV steelhead were originally listed as threatened on March 19, 1998 (63 FR 13347). This DPS consists of steelhead populations in the Sacramento and San Joaquin river basins in California's Central Valley. On August 15, 2011, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of CCV steelhead as threatened (76 FR 157). This decision also included the Coleman National Fish Hatchery and Feather River Hatchery steelhead populations. These populations were previously included in the DPS but were not deemed essential for conservation and thus not part of the listed steelhead population. Critical habitat was designated for CCV steelhead on September 2, 2005 (70 FR 52488). Critical habitat includes the stream channels to the ordinary high water line within designated stream reaches such as those of the American, Feather, and Yuba Rivers, and Deer, Mill, Battle, Antelope, and Clear creeks in the Sacramento River basin; the Calaveras, Mokelumne, Stanislaus, Tuolumne, and Merced rivers in the San Joaquin River basin; and, the Sacramento and San Joaquin Rivers and Delta.

B. Species Life History, Population Dynamics, and Likelihood of Survival and Recovery

1. Chinook salmon

a. *General Life History*

Chinook salmon exhibit two generalized freshwater life history types (Healey 1991). "Stream-type" Chinook salmon, enter freshwater months before spawning and reside in freshwater for a year or more following emergence, whereas "ocean-type" Chinook salmon spawn soon after entering freshwater and migrate to the ocean as fry or parr within their first year. CV spring-run Chinook salmon exhibit a stream-type life history. Adults enter freshwater in the spring, hold over summer, spawn in fall, and the juveniles typically spend a year or more in freshwater before emigrating. Adults enter freshwater in winter or early spring, and delay spawning until spring or early summer (stream-type). Adequate instream flows and cool water temperatures are more critical for the survival of Chinook salmon exhibiting a stream-type life history due to over summering by adults and/or juveniles.

Chinook salmon typically mature between 2 and 6 years of age (Myers *et al.* 1998). Freshwater entry and spawning timing generally are thought to be related to local water temperature and flow regimes. Runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and the actual time of spawning (Myers *et al.* 1998). Both spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991).

During their upstream migration, adult Chinook salmon require stream flows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate stream flows are necessary to allow adult passage to upstream holding habitat. The preferred temperature range for upstream migration is 38 to 56 degrees Fahrenheit (F) (Bell 1991; CDFG 1998). Boles *et al.* (1988) recommends water temperatures below 65 degrees F for adult Chinook salmon migration, and Lindley *et al.* (2004) report that adult migration is blocked when temperatures reach 70 degrees F, and that fish can become stressed as temperatures approach 70 degrees F. Reclamation reports that spring-run Chinook salmon holding in upper watershed locations prefer water temperatures below 60 degrees F; although salmon can tolerate temperatures up to 65 degrees F before they experience an increased susceptibility to disease.

Information on the migration rates of adult Chinook salmon in freshwater is scant and primarily comes from the Columbia River basin where information regarding migration behavior is needed to assess the effects of dams on travel times and passage (Matter and Sandford 2003). Keefer et al. (2004) found migration rates of Chinook salmon ranging from approximately 10 kilometers (km) per day to greater than 35 km per day and to be primarily correlated with date, and secondarily with discharge, year, and reach, in the Columbia River basin. Matter and Sanford (2003) documented migration rates of adult Chinook salmon ranging from 29 to 32 km per day in the Snake River. Adult Chinook salmon inserted with sonic tags and tracked throughout the Delta and lower Sacramento and San Joaquin rivers were observed exhibiting substantial upstream and downstream movement in a random fashion while on their upstream migration (California Bay-Delta Authority (CALFED) 2001). Adult salmonids migrating upstream are assumed to make greater use of pool and mid-channel habitat than channel margins (Stillwater Sciences 2004), particularly larger salmon such as Chinook salmon, as described by Hughes (2004). Adults are thought to exhibit crepuscular behavior during their upstream migrations; meaning that they primarily are active during twilight hours. Recent hydro-acoustic monitoring showed peak upstream movement of adult CV spring-run Chinook salmon in lower Mill Creek, a tributary to the Sacramento River, occurring in the 4-hour period before sunrise and again after sunset.

Spawning Chinook salmon require clean, loose gravel in swift, relatively shallow riffles or along the margins of deeper runs, and suitable water temperatures, depths, and velocities for redd construction and adequate oxygenation of incubating eggs. Chinook salmon spawning typically occurs in gravel beds that are located at the tails of holding pools (USFWS 1995). The range of water depths and velocities in spawning beds that Chinook salmon find acceptable is very broad.

The upper preferred water temperature for spawning Chinook salmon is 55 to 57 degrees F (Chambers 1956; Smith 1973; Bjornn and Reiser 1991; Snider 2001).

During the four to six week period when alevins remain in the gravel, they utilize their yolk-sac to nourish their bodies. As their yolk-sac is depleted, fry begin to emerge from the gravel to begin exogenous feeding in their natal stream. The post-emergent fry disperse to the margins of their natal stream, seeking out shallow waters with slower currents, finer sediments, and bank cover such as overhanging and submerged vegetation, root wads, and fallen woody debris, and begin feeding on zooplankton, small insects, and other micro-crustaceans. As they switch from endogenous nourishment to exogenous feeding, the fry's yolk-sac is reabsorbed, and the belly suture closes over the former location of the yolk-sac (button-up fry). Fry typically range from 25 mm to 40 mm during this stage. Some fry may take up residence in their natal stream for several weeks to a year or more, while others actively migrate, or are displaced downstream by the streams' current. Once started downstream, fry may continue downstream to the estuary and rear, or may take up residence in river reaches along the way for a period of time ranging from weeks to a year (Healey 1991).

Rearing fry seek near shore habitats containing beneficial aspects such as riparian vegetation and associated substrates important for providing aquatic and terrestrial invertebrates, predator avoidance, and slower velocities for resting (NMFS 1996a). The benefits of shallow water habitats for salmonid rearing also have recently been realized as shallow water habitat has been found to be more productive than the main river channels, supporting higher growth rates, partially due to higher prey consumption rates, as well as favorable environmental temperatures (Sommer *et al.* 2001).

When juvenile Chinook salmon reach a length of 50 to 57 mm, they move into deeper water with higher current velocities, but still seek shelter and velocity refugia to minimize energy expenditures. In the mainstems of larger rivers, juveniles tend to migrate along the margins and avoid the elevated water velocities found in the thalweg of the channel. When the channel of the river is greater than 9 to 10 feet in depth, juvenile salmon tend to inhabit the surface waters (Healey 1982). Migrational cues, such as increasing turbidity from runoff, increased flows, changes in day length, or intraspecific competition from other fish in their natal streams may spur outmigration of juveniles when they have reached the appropriate stage of maturation (Kjelson *et al.* 1982; Brandes and McLain 2001).

Similar to adult movement, juvenile salmonid downstream movement is primarily crepuscular. Martin *et al.* (2001) found that the daily migration of juveniles passing Red Bluff Diversion Dam (RBDD) is highest in the four hour period prior to sunrise. Juvenile Chinook salmon migration rates vary considerably presumably depending on the physiological stage of the juvenile and hydrologic conditions. Kjelson *et al.* (1982) found Chinook salmon fry travel as fast as 30 km per day in the Sacramento River and Sommer *et al.* (2001) found rates ranging from approximately 0.5 miles up to more than six miles per day in the Yolo Bypass. As Chinook salmon begin the smoltification stage, they prefer to rear further downstream where ambient salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980; Levy and Northcote 1981).

Fry and parr may rear within riverine or estuarine habitats of the Sacramento River, the Delta, and their tributaries. In addition, Central Valley Chinook salmon juveniles have been observed rearing in the lower reaches of non-natal tributaries and intermittent streams in the Sacramento Valley during the winter months (Maslin *et al.* 1997; Snider 2001). Within the Delta, juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels, and sloughs (McDonald 1960; Dunford 1975). Cladocerans, copepods, amphipods, and larvae of diptera, as well as small arachnids and ants are common prey items (Kjelson *et al.* 1982; Sommer *et al.* 2001; MacFarlane and Norton 2002). Shallow water habitats are more productive than the main river channels, supporting higher growth rates, partially due to higher prey consumption rates, as well as favorable environmental temperatures (Sommer *et al.* 2001). Optimal water temperatures for the growth of juvenile Chinook salmon in the Delta are between 54 to 57 degrees F (Brett 1952). In Suisun and San Pablo Bays water temperatures reach 54 degrees F by February in a typical year. Other portions of the Delta (*i.e.*, South Delta and Central Delta) can reach 70 degrees F by February in a dry year. However, cooler temperatures are usually the norm until after the spring runoff has ended.

Within the estuarine habitat, juvenile Chinook salmon movements are dictated by the tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide recedes (Levy and Northcote 1982; Levings 1982; Levings *et al.* 1986; Healey 1991). As juvenile Chinook salmon increase in length, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tides into shallow water habitats to feed (Allen and Hassler 1986). In Suisun Marsh, Moyle *et al.* (1989) reported that Chinook salmon fry tend to remain close to the banks and vegetation, near protective cover, and in dead-end tidal channels. Kjelson *et al.* (1982) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to near shore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. During the night, juveniles were distributed randomly in the water column, but would school up during the day into the upper three meters of the water column. Available data indicate that juvenile Chinook salmon use Suisun Marsh extensively both as a migratory pathway and rearing area as they move downstream to the Pacific Ocean. Juvenile Chinook salmon were found to spend about 40 days migrating through the Delta to the mouth of San Francisco Bay and grew little in length or weight until they reached the Gulf of the Farallones (MacFarlane and Norton 2002). Based on the mainly ocean-type life history observed (*i.e.*, fall-run Chinook salmon) MacFarlane and Norton (2002) concluded that unlike other salmonid populations in the Pacific Northwest, Central Valley Chinook salmon show little estuarine dependence and may benefit from expedited ocean entry.

b. *CV spring-run Chinook salmon*

Historically the spring-run Chinook salmon were the second most abundant salmon run in the Central Valley (CDFG 1998). These fish occupied the upper and middle reaches (1,000 to 6,000 feet) of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit rivers, with smaller populations in most tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1904, Clark 1929). The Central Valley Technical Review Team (CVTRT) estimated that historically there were 18 or 19 independent populations of Central Valley spring-run Chinook salmon, along with a number of dependent populations and four diversity groups (Lindley *et al.* 2004). Of these 18 populations, only three extant populations currently exist (Mill, Deer, and Butte creeks on the upper Sacramento River) and they represent only the Northern Sierra Nevada Diversity group. All populations in the Basalt and Porous Lava group and the Southern Sierra Nevada Diversity Group have been extirpated. The range of the Southern Sierra Nevada Diversity Group includes the San Joaquin River and tributary streams including the Merced, Tuolumne, Stanislaus, Calaveras, and Mokelumne rivers.

The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). The spring run was most abundant in the San Joaquin system, ascending and occupying the high-elevation streams fed by snow-melt where they over-summered until the fall spawning season (Yoshiyama *et al.* 1996). Historically the Kings River flowed into the northeast part of Tulare Lake, and its waters occasionally ran into the San Joaquin River during wet periods when water levels became high enough in Tulare Lake to overflow and connect the two drainages. Stream flows would have been greatest during the spring snow-melt period, so it is most likely that the spring run was the predominant or, perhaps, the only run to occur there. In the San Joaquin River the spring run historically ascended the river past the present site of Kerckhoff Power House in the Sierra foothills to spawning grounds in the higher reaches (Yoshiyama *et al.* 1996). The Friant Division of the Central Valley Project consists of Friant Dam, constructed at Millerton, with two significant canals, the Friant-Kern and the Madera canals, which were intended to divert all flows, except flood level flows, of the San Joaquin River in to these canals for delivery to rich farmlands of the San Joaquin Valley. Friant Dam was constructed by 1945, Before the construction of Friant Dam, and nearly 50,000 adults were counted in the San Joaquin River alone (Fry 1961). Completion and operation of the canals of the Friant Division resulted in the San Joaquin River running dry in many locations with the concomitant extirpation of the San Joaquin River salmon runs below Friant Dam. Construction of other low elevation dams in the foothills of the Sierras on the American, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers extirpated Central Valley spring-run Chinook salmon from these watersheds. Naturally-spawning populations of Central Valley spring-run Chinook salmon currently are restricted to accessible reaches of the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (CDFG 1998). Table 1 shows when these abundances occur in their associated watersheds.

Table 1. The temporal occurrence of adult (a) and juvenile (b) Central Valley spring-run Chinook salmon in the Sacramento River. Darker shades indicate months of greatest relative abundance.

(a) Adult

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
[1,2]Sac.River basin			Medium	Medium	High	High	Medium	Medium	Medium			
[3]Sac. River			Medium	Medium	Medium	Medium	Medium					
[4]Mill Creek			Low	Medium / High	High	High / Medium	Medium / Low	Low /				
[4]Deer Creek			Low	Medium / High	High	High / Medium	Medium /					
[4]Butte Creek		Medium	Medium	Medium	Medium	Medium	Medium					

(b) Juvenile

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
[5]Sac. River Tribs	Medium	Medium	Medium							Medium	High	High
[6]Upper Butte Creek	High	High	Medium	Medium	Medium	Low				Low	Low	Medium
[4]Mill, Deer, Butte Creeks	High	High	Medium	Medium	Medium	Low				Low	Low	Low
[3]Sac. River at RBDD	High	Low	Low	Low	Low						High	High
[7]Sac. River at Knights Landing (KL)	Medium	Medium	High	High	Medium						Medium	High

Source: Yoshiyama *et al.* 1998; Moyle 2002; Myers *et al.* 1998; Lindley *et al.* 2007; CDFG 1998; McReynolds *et al.* 2005; Ward *et al.* 2002, 2003; Snider and Titus 2000

Relative Abundance: ■ = High ■ = Medium ■ = Low

Adult Central Valley spring-run Chinook salmon leave the ocean to begin their upstream migration in late January and early February (CDFG 1998) and enter the Sacramento River between March and September, primarily in May and June (see Table 6 in text; Yoshiyama *et al.* 1998, Moyle 2002). Lindley *et al.* (2007) indicates adult Central Valley spring-run Chinook salmon enter native tributaries from the Sacramento River primarily between mid-April and mid-June. Typically, spring-run Chinook salmon utilize mid- to high-elevation streams that provide appropriate temperatures and sufficient flow, cover, and pool depth to allow over-summering while conserving energy and allowing their gonadal tissue to mature (Yoshiyama *et al.* 1998).

Spring-run Chinook salmon spawning occurs between September and October depending on water temperatures. Between 56 and 87 percent of adult spring-run Chinook salmon that enter the Sacramento River basin to spawn are 3 years old (Calkins *et al.* 1940; Fisher 1994). Spring-run Chinook salmon fry emerge from the gravel from November to March (Moyle 2002) and the emigration timing is highly variable, as they may migrate downstream as young-of-the-year or as juveniles or yearlings. The modal size of fry migrants at approximately 40 mm between December and April in Mill, Butte, and Deer creeks reflects a prolonged emergence of fry from the gravel (Lindley *et al.* 2007). Studies in Butte Creek (Ward *et al.* 2002, 2003, McReynolds *et al.* 2005) found the majority of Central Valley spring-run Chinook salmon migrants to be fry occurring primarily during December, January, and February; and that these movements appeared to be influenced by flow. Small numbers of Central Valley spring-run Chinook salmon remained in Butte Creek to rear and migrated as yearlings later in the spring. Juvenile emigration patterns in Mill and Deer creeks are very similar to patterns observed in Butte Creek, with the exception that Mill and Deer creek juveniles typically exhibit a later young-of-the-year migration and an earlier yearling migration (Lindley *et al.* 2007).

Once juveniles emerge from the gravel they initially seek areas of shallow water and low velocities while they finish absorbing the yolk sac and transition to exogenous feeding (Moyle 2002). Many also will disperse downstream during high-flow events. As is the case in other salmonids, there is a shift in microhabitat use by juveniles to deeper faster water as they grow larger. Microhabitat use can be influenced by the presence of predators which can force fish to select areas of heavy cover and suppress foraging in open areas (Moyle 2002). The emigration period for spring-run Chinook salmon extends from November to early May, with up to 69 percent of the young-of-the-year fish outmigrating through the lower Sacramento River and Delta during this period (CDFG 1998). Peak movement of juvenile Central Valley spring-run Chinook salmon in the Sacramento River at Knights Landing occurs in December, and again in March and April. However, juveniles also are observed between November and the end of May (Snider and Titus 2000). Based on the available information, the emigration timing of Central Valley spring-run Chinook salmon appears highly variable (CDFG 1998). Some fish may begin emigrating soon after emergence from the gravel, whereas others over-summer and emigrate as yearlings with the onset of intense fall storms (CDFG 1998).

The spring-run Chinook salmon populations that formerly occurred in the basalt and porous-lava region and southern Sierra Nevada region have been extirpated. The northwestern California region contains a few ephemeral populations (*e.g.*, Clear, Cottonwood, and Thomes creeks) of spring-run Chinook salmon that are likely dependent on the Northern Sierra populations for their continued existence. Over the long term, these remaining populations are considered to be vulnerable to catastrophic events, such as volcanic eruptions from Mount Lassen or large forest fires due to the close proximity of their headwaters to each other. Drought is also considered to pose a significant threat to the viability of the spring-run Chinook salmon populations in these three watersheds due to their close proximity to each other. One large event could eliminate all three populations. Figure 2 shows spring-run escapement for the Sacramento watershed through February 2011.

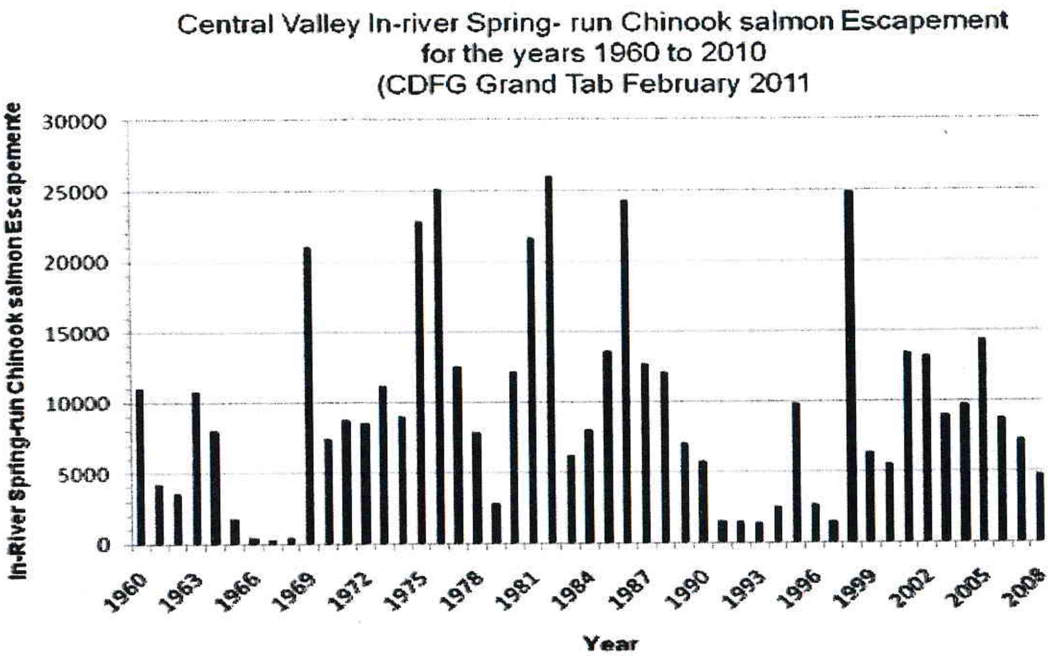


Figure 2: Annual estimated Central Valley in-river spring-run Chinook salmon escapement population for the Sacramento River watershed for years 1960 through 2010 (CDFG Grand Tab 2011).

Recent status reviews by NMFS Southwest Fisheries Science Center (SWFSC) and Central Valley Office have led to the following discernments. The spring-run ESU boundary has not changed. This review and analysis concluded that the Feather River hatchery stock of spring run Chinook was substantially divergent from other natural stocks in the Central Valley (Butte, Deer and Mill creeks) as a result of introgression with fall-run Chinook salmon at the hatchery. Nevertheless, NMFS ultimately concluded this hatchery stock should be included in the ESU because it still exhibited spring-run migration timing and was the best opportunity for restoring a more natural spring-run population in the Feather River. Overall escapements have declined over the past 10 years, in particular since 2006. At the ESU level, the reestablishment of spring-run Chinook salmon into Battle Creek (persisting since around 1995) and the increasing abundance of spring-run Chinook salmon in Clear Creek are improving the status of CV spring-run Chinook salmon. Further efforts will need to involve more than restoration of currently accessible watersheds. The draft Central Valley Recovery Plan calls for reestablishing populations into historical habitats currently blocked by large dams, such as those underway to establish spring-run Chinook salmon production in the San Joaquin River below Friant Dam, a population above Shasta Dam, and to facilitate passage of fish above Englebright Dam on the Yuba River will be needed to make the ESU viable. New information available since Good *et al.* (2005) indicates an increased extinction risk for the ESU (Williams *et al.* 2011). The available information indicates that fishery impacts on the CV spring-run Chinook salmon ESU have not changed appreciably since the 2005 status review (Good *et al.* 2005), except that impacts were extremely low to non-existent in 2008 and 2009. Climate change is expected to exacerbate existing stressors and pose new threats to Central Valley salmonids, including the CV spring-run Chinook, by reducing the quantity and quality of inland habitat (Lindley *et al.* 2007). The poor ocean conditions in recent years clearly have had adverse impacts on the CV spring-run Chinook ESU. With a few exceptions, CV spring-run Chinook salmon populations have declined over the past 10 years particularly since 2006. Overall, the NMFS SWFSC concluded in their viability report that the status of CV spring-run Chinook salmon ESU has probably deteriorated since the 2005 status review and that its extinction risk has increased (Williams *et al.* 2011). The status of this ESU has worsened since the last review, and therefore, we recommend that its status be reassessed in 2-3 years if it does not respond positively to improvements in environmental conditions and management actions.

(1) Population Dynamics. The CV spring-run Chinook salmon ESU has displayed broad fluctuations in adult abundance, ranging from 1,403 in 1993 to 25,890 in 1982. The genetic integrity of Feather River spring-run Chinook salmon is questionable because of the significant temporal and spatial overlap between spawning populations of spring-run and fall-run Chinook salmon (Good *et al.* 2005). For the reasons discussed above, the Feather River spring-run Chinook population numbers are not included in the following discussion of ESU abundance. The average abundance for the ESU was 12,590 for the period of 1969 to 1979, 13,334 for the period of 1980 to 1990, 6,554 from 1991 to 2001, and 16,349 between 2002 and 2005. For the period of 2006 to 2008 the average abundance for the ESU fell to a low of 854 (CDFG 2009). Sacramento River tributary populations in Mill, Deer, and Butte creeks are probably the best trend indicators for the CV spring-run Chinook ESU as a whole because these streams contain the primary independent populations within the ESU. Generally, these streams have shown a positive escapement trend since 1991 until recently. Escapement numbers are dominated by Butte Creek returns, which have averaged over 7,000 fish since 1995 (until 2005). During this same period, adult returns on Mill Creek have averaged 778 fish, and 1,463 fish on Deer Creek. Although recent trends had been positive, annual abundance estimates display a high level of fluctuation, and the overall number of CV spring-run Chinook salmon remains well below estimates of historic abundance. Additionally, in 2003 high water temperatures, high fish densities, and an outbreak of Columnaris Disease (*Flexibacter Columnaris*) and Ichthyophthiriasis (*Ichthyophthirius multifiis)* contributed to the pre-spawning mortality of an estimated 11,231 adult spring-run Chinook salmon in Butte Creek. Most recently from 2007 to 2011 most spring-run Chinook salmon population numbers have shown a steady decrease, resulting in the tributary population's 5-year average being 3,961, the lowest since before 1998.

(2) Viable Salmonid Population Summary for Central Valley spring-run Chinook Salmon. The following summary has been compiled from the best available data and information on CV spring-run Chinook salmon to provide a general synopsis of the viability parameters for this ESU.

Abundance. With a few exceptions, escapements have declined over the past 10 years, in particular since 2006. The recent declines in abundance place the Mill and Deer creek populations in the high extinction risk category due to their rate of decline, and in the case of Deer Creek, also the level of escapement. Butte Creek continues to satisfy the criteria for low extinction risk, although the rate of decline is close to triggering the population decline criterion for high risk. Overall, the recent declines have been significant but not severe enough to qualify as a catastrophe under the criteria of Lindley *et al.* (2007). On the brighter side, spring-run Chinook salmon appear to be repopulating Battle Creek, home to an historical independent population in the Basalt and Porous Lava Diversity Group that was extirpated for many decades. This population has increased in abundance to levels that would qualify it for a moderate extinction risk score. Similarly, the spring-run Chinook salmon population in Clear Creek has been increasing, although Lindley *et al.* (2004) classified this population as a dependent population, and thus is not expected to exceed the low-risk population size threshold of 2500 fish.

Until recently, we were unaware of any reports of hatchery-origin fish spawning in the higher elevation areas of Butte, Deer or Mill creeks utilized by spring-run Chinook. In 2010, 10 coded-wire tags of Feather River spring Chinook salmon were recovered from a sample of 1,113 carcasses in the upper reached of Butte Creek (T. McReynolds, CDFG, pers. comm., 15 December 2010). As 100 percent of FRH spring Chinook salmon production is marked and tagged, this translates into slightly less than 1 percent of the Butte Creek returns being comprised of hatchery strays. This is well below the 10 percent allowable stray rate for out-of-diversity-group-origin fish within one generation. Prolonged influx of 46 FRH strays at even this low level is undesirable, as it would cause the receiving population to shift to a moderate risk level after four generations of such impact. The CV spring-run Chinook salmon ESU has experienced a trend of increasing abundance in some natural populations, most dramatically in the Butte Creek population (Good *et al.* 2005). There has been more opportunistic utilization of migration-dependent streams overall. The FRH spring-run stock has been included in the ESU based on its genetic linkage to the natural population and the potential development of a conservation strategy for the hatchery program.

Productivity. The 5-year geometric mean for the extant Butte, Deer, and Mill creek spring-run populations ranges from 491 to 4,513 fish (Good *et al.* 2005), indicating increasing productivity over the short-term and projected as likely to continue (Good *et al.* 2005). The productivity of the Feather River and Yuba River populations and contribution to the CV spring-run ESU currently is unknown.

Spatial Structure. Spring-run Chinook salmon presence has been reported more frequently in several upper Central Valley creeks, but the sustainability of these runs is unknown. Butte Creek spring-run cohorts have recently utilized all available habitat in the creek; the population cannot expand further and it is unknown if individuals have opportunistically migrated to other systems. The spatial structure of the spring-run ESU has been seriously compromised by the extirpation of all San Joaquin River basin spring-run populations.

Diversity. The CV spring-run ESU fails to meet the "representation and redundancy rule," since the Northern Sierra Nevada is the only diversity group in the spring-run ESU that contains demonstrably viable populations out of at least 3 diversity groups that historically contained them. Independent populations of spring-run only occur within the Northern Sierra Nevada diversity group. The Northwestern California Diversity Group contains a few ephemeral populations of spring-run that are likely currently dependent on the Northern Sierra Nevada populations for their continued existence. The spring-run populations that historically occurred in the Basalt and Porous Lava, and Southern Sierra Nevada diversity groups have been extirpated, although a small population in Battle Creek has been reestablished and persisting over the last 15 years. Over the long term, the three remaining independent populations are considered to be vulnerable to catastrophic events, such as volcanic eruptions from Mount Lassen or large forest fires due to the close proximity of their headwaters to each other. Drought is also considered to pose a significant threat to the viability of the spring-run populations in the Deer, Mill and Butte Creek watersheds due to their close proximity to each other. Feather River spring-run have introgressed with the fall-run, and it appears that the Yuba River population may have been impacted by FRH fish straying into the Yuba River. Additionally, the diversity of the spring-run ESU has been further reduced with the loss of the San Joaquin River basin spring-run populations. Overall, CV spring-run Chinook salmon extinction risk has increased (Williams *et al.* 2011).

2. CCV steelhead

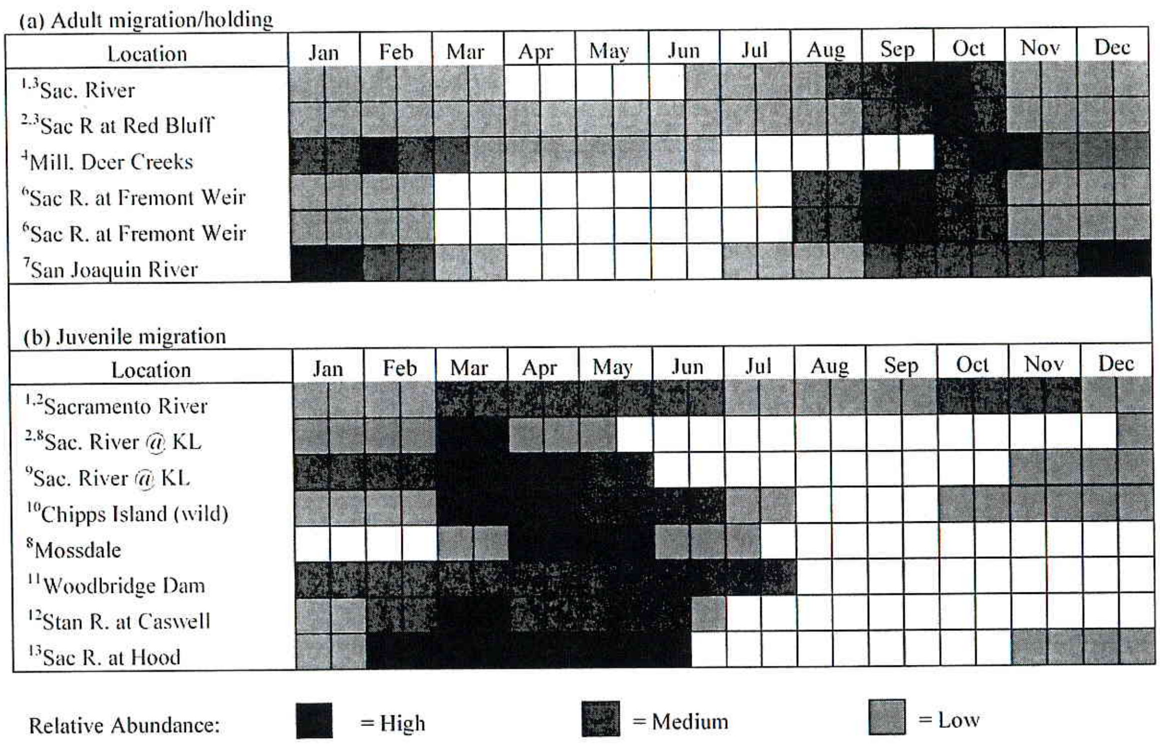
a. *General Life History*

Steelhead can be divided into two life history types, summer-run steelhead and winter-run steelhead, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration, stream-maturing and ocean-maturing. Only winter-run (ocean maturing) steelhead currently are found in California Central Valley rivers and streams (Moyle 2002; McEwan and Jackson 1996). Summer-run steelhead has been extirpated due to a lack of suitable holding and staging habitat, such as cold water pools in the headwaters of CV streams, presently located above impassible dams (Lindley *et al.* 2006).

CCV steelhead remain in the ocean for up to four years before returning to their natal streams as adults to spawn (Shapovalov and Taft 1954). Adult steelhead size depends on the length of their ocean residency (Meehan and Bjornn 1991). Unlike Pacific salmon, steelhead do not appear to form schools in the ocean (Behnke 1992). Steelhead in the southern part of their range appear to migrate close to the continental shelf, while more northern populations may migrate throughout the northern Pacific Ocean (Barnhart 1991). CCV steelhead generally leave the ocean from August through April (Busby *et al.* 1996) and enter freshwater from August to November and spawn from December to April, with peaks from January through March, in small streams and tributaries where cool, well oxygenated water is available year-round (Williams 2006; Hallock *et al.* 1961; McEwan and Jackson 1996). CCV Steelhead hold over in pools while maturing sexually, while others begin sexual maturation in the ocean and spawn within a few months after entering streams (Williams 2006). Timing of upstream migration is correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. The minimum stream depth necessary for successful upstream migration is 13 cm (Thompson 1972). Table 2 show the various migration and holding periods for CCV steelhead in various central valley watersheds.

Adults typically spend a few months in freshwater before spawning (Williams 2006). Female steelhead construct redds in suitable gravels, primarily in pool tailouts and heads of riffles. Steelhead generally return to freshwater at ages 2 and 3 and range in size from 2 to 12 pounds (Reynolds *et al.* 1993). The number of eggs laid per female depends on size and origin of the fish (Moyle 2002). Steelhead about 55 cm long may have fewer than 2000 eggs, whereas steelhead 85 cm long can have 5,000 to 10,000 eggs, depending on the stock (Meehan and Bjornn 1991).

Table 2. The temporal occurrence of adult (a) and juvenile (b) Central Valley steelhead in the Central Valley. Darker shades indicate months of greatest relative abundance.
Sources: Hallock 1961; McEwan 2001; USFWS unpublished data; CDFG 1995; Hallock *et al.* 1957; Bailey 1954; CDFG Steelhead Report Card Data; CDFG unpublished data; Snider and Titus 2000; Nobriga and Cadrett 2003; Jones & Stokes Associates, Inc., 2002; S.P. Cramer and Associates, Inc. 2000 and 2001; Schaffter 1980, 1997.



Unlike Pacific salmon, steelhead are iteroparous, which are capable of spawning more than once before death (Busby *et al.* 1996). However, it is rare for steelhead to spawn more than twice before dying; most that do so are females (Busby *et al.* 1996). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Although one-time spawners are the great majority, Shapolov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Hatchery steelhead are typically less likely than wild fish to survive to spawn a second time (Leider *et al.* 1986). Post-spawning steelhead may migrate downstream to the ocean immediately after spawning or may spend several weeks holding in pools before out migrating (Shapovalov and Taft 1954). Steelhead eggs hatch in three to four weeks at 10 to 15 degrees Celsius (Moyle 2002). The length of time it takes for eggs to hatch depends mostly on water temperature. After hatching, alevins remain in the gravel for an additional two to five weeks while absorbing their yolk sacs, and emerge in spring or early summer (Barnhart 1991). Fry emerge from the gravel usually about four to six weeks after hatching, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time (Shapovalov and Taft 1954). Upon emergence, fry inhale air at the stream surface to fill their air bladders, absorb the remains of their yolks, and start to feed actively, often in schools (Barnhart 1991; NMFS 1996a). Then the newly emerged fry move to the shallow, protected areas associated within the stream margin (McEwan and

Jackson 1996) and they soon move to other areas of the stream and establish feeding locations, which they defend (Shapovalov and Taft 1954). Fry are typically less than 50 millimeters standard length (SL) (Moyle 2002). As fry increase in size and their swimming abilities improve during late summer and fall, they increasingly use areas with cover and exhibit a preference for higher velocity, deeper mid-channel areas near the thalweg (Hartman 1965; Everest and Chapman 1972; Fontaine 1988). Optimal water temperatures for growth range from 15 to18 degrees Celsius (Moyle 2002).

Juvenile steelhead (parr) rear in freshwater for one to three years before outmigrating to the ocean as smolts (Moyle 2002). The time that parr spend in freshwater appears to be related to growth rate, with larger, faster-growing members of a cohort smolting earlier (Peven *et al.* 1994). Juveniles occupy a wide range of habitats, preferring deep pools, as well as higher velocity rapid and cascade habitats (Bisson *et al.* 1982, 1988). During periods of low temperatures (< 44.6 degrees F) and high flows associated with the winter months, juvenile steelhead seek refuge in interstitial spaces in cobble and boulder substrates (Bustard and Narver 1975; Everest *et al.* 1986). Juveniles' winter hiding behavior reduces their metabolism and food intake requirements and minimizes their exposure to predation and high flows (Bustard and Narver 1975). Steelhead rearing during the summer takes place primarily in higher velocity areas in pools, although young-of-year also are abundant in glides and riffles. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small woody debris. Cover is an important habitat component for juvenile steelhead both as velocity refugia and as a means of avoiding predation (Meehan and Bjornn 1991).

Steelhead smolts migrate downstream during most months of the year , but the peak period of emigration occurs in spring, with a much smaller peak in the fall (Hallock *et al.* 1961). Emigrating steelhead use the lower reaches of a river and the Delta for rearing and as a migration corridor to the ocean. Juvenile steelhead feed mostly on drifting aquatic organisms and terrestrial insects and will also take active bottom invertebrates (Moyle 2002). Some may utilize tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas in the Delta as rearing areas for short periods prior to their final emigration to the sea. Hallock *et al.* (1961) found that juvenile steelhead migrate downstream during most months of the year, but the peak period of emigration occurred in the spring with a much smaller peak in the fall. Nobriga and Cadrett (2003) also have verified these temporal findings based on analysis of captures at Chipps Island, Suisun Bay.

Historic CCV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached one to two million adults annually (McEwan 2001). By the early 1960s the steelhead run size had declined to about 40,000 adults (McEwan 2001). About 80 percent of habitat in the Central Valley was historically available to anadromous *O. mykiss* is now behind impassible dams (Lindley *et al.* 2006). The extent of habitat loss for steelhead most likely was much higher than that for salmon because steelhead were undoubtedly more extensively distributed. Due to their superior jumping ability, the timing of their upstream migration which coincided with the winter rainy season, and their less restrictive preferences for spawning gravels, steelhead could have utilized at least hundreds of miles of smaller tributaries not accessible to the earlier-spawning salmon (Yoshiyama *et al.* 1996). Many historical populations of CCV steelhead are entirely above impassable barriers and may persist as resident or adfluvial rainbow trout, although they are presently not considered part of the DPS. Steelhead were found as far south to the Kings River (and possibly Kern River systems in wet years) (McEwan 2001). Native American groups such as the Chunut people have had accounts of steelhead in the Tulare Basin. A Chunut informant interviewed by Latta (1977) attested to the presence of steelhead in Tulare Lake.

In the Mokelumne River, East Bay Municipal Utilities District (EBMUD) has included steelhead in their redd surveys on the Lower Mokelumne River since the 1999-2000 spawning season. Based on data from these surveys, the overall trend suggests that redd numbers have slightly increased over the years (2000-2010). However, according to Satterthwaite *et al.* (2010), it is likely that most of the *O. mykiss* spawning in the Mokelumne River are non-anadromous (ore resident) fish rather than steelhead. There are monitoring efforts such as rotary screw traps and weirs in the Calaveras, Stanislaus, Tuolumne, and Merced rivers. The data in these monitoring efforts show that steelhead numbers are very small. Although there have been recent restoration efforts in the San Joaquin River tributaries, CCV steelhead populations in the San Joaquin Basin have been generally showing a continuing decline, an overall low abundance, and fluctuating return rates. Lindley *et al.* (2007) developed viability criteria for Central Valley salmonids. Using data through 2005, Lindley *et al.* (2007) found that data were insufficient to determine the status of any of the naturally-spawning populations of California Central Valley steelhead, except for those spawning in rivers adjacent to hatcheries, which were likely to be at high risk of extinction due to extensive spawning of hatchery-origin fish in natural areas.

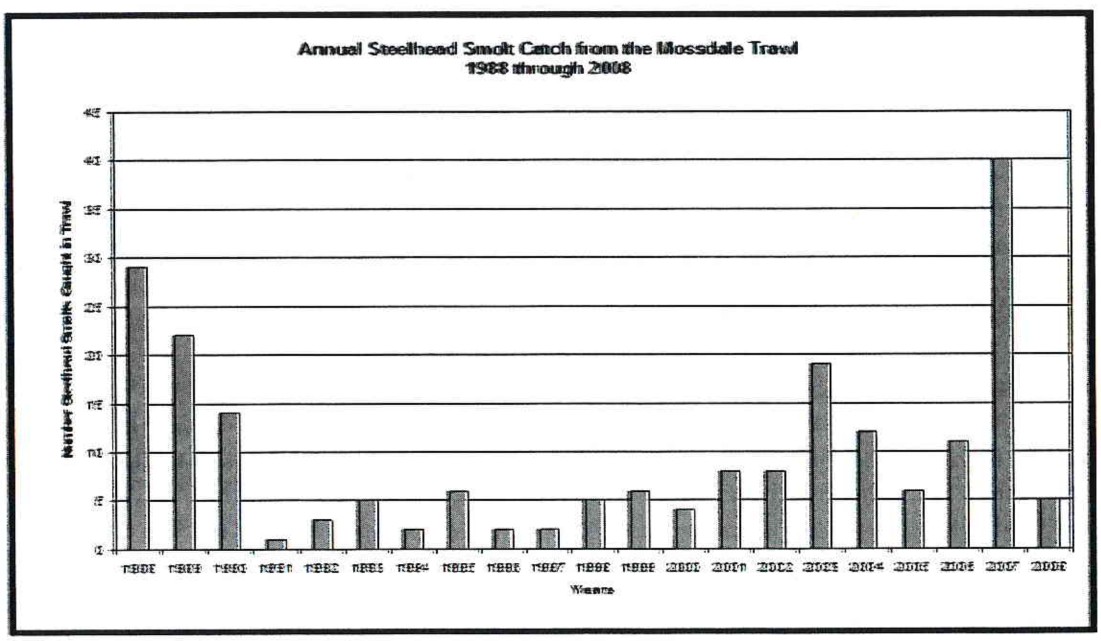


Figure 3: Annual number of California Central Valley steelhead smolts caught while Kodiak trawling at the Mossdale monitoring location on the San Joaquin River (Marston 2004, SJRG 2007, Jonathan Speegle, USFWS 2008, personal communication).

(1) Population Dynamics. Historic CCV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached one to two million adults annually (McEwan 2001).

By the early 1960s the steelhead run size had declined to about 40,000 adults (McEwan 2001). Over the past 30 years, the naturally-spawned steelhead populations in the upper Sacramento River have declined substantially. Hallock *et al.* (1961) estimated an average of 20,540 adult steelhead through the 1960s in the Sacramento River, upstream of the Feather River. Steelhead counts at the RBDD declined from an average of 11,187 for the period of 1967 to 1977, to an average of approximately 2,000 through the early 1990s, with an estimated total annual run size for the entire Sacramento-San Joaquin system, based on RBDD counts, to be no more than 10,000 adults (McEwan and Jackson 1996; McEwan 2001). Steelhead escapement surveys at RBDD ended in 1993 due to changes in dam operations.

Recent estimates from trawling data in the Delta indicate that approximately 100,000 to 300,000 (mean 200,000) smolts emigrate to the ocean per year, representing approximately 3,600 female steelhead spawners in the Central Valley basin (Good *et al.* 2005). This can be compared with McEwan's (2001) estimate of one million to two million spawners before 1850, and 40,000 spawners in the 1960s.

Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill creeks and the Yuba River. Small populations may exist in Battle Creek, Big Chico and Butte creeks and a few wild steelhead are produced in the American and Feather rivers (McEwan and Jackson 1996). Snorkel surveys since 1999 indicate that steelhead are present in Clear Creek (Giovanetti 2010). Because of the large resident *O. mykiss* population in Clear Creek, steelhead spawner abundance has not been estimated.

Until recently, CCV steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected small self-sustaining populations of steelhead in the Stanislaus, Mokelumne, and Calaveras rivers, and other streams previously thought to be devoid of steelhead (McEwan 2001). On the Stanislaus River, steelhead smolts have been captured in rotary screw traps at Caswell State Park and Oakdale each year since 1995 (S.P. Cramer and Associates Inc. 2000, 2001). It is possible that naturally-spawning populations exist in many other streams but are undetected due to lack of monitoring programs (IEP Steelhead Project Work Team 1999). Incidental catches and observations of steelhead juveniles also have occurred on the Tuolumne and Merced rivers during fall-run Chinook salmon monitoring activities, indicating that steelhead are widespread throughout accessible streams and rivers in the Central Valley (Good *et al.* 2005). CDFG staff has prepared juvenile migrant CCV steelhead catch summaries on the San Joaquin River near Mossdale representing migrants from the Stanislaus, Tuolumne, and Merced rivers. Based on trawl recoveries at Mossdale between 1988 and 2002, as well as rotary screw trap efforts in all three tributaries, CDFG staff stated that it is "clear from this data that rainbow trout do occur in all the tributaries as migrants and that the vast majority of them occur on the Stanislaus River" (Letter from Dean Marston, CDFG, to Madelyn Martinez, NMFS, January 9, 2003). The documented returns on the order of single fish in these tributaries suggest that existing populations of CCV steelhead on the Tuolumne, Merced, and lower San Joaquin rivers are severely depressed.

Good (2005) indicated that prior population census estimates completed in the 1990s found the CV steelhead spawning population above RBDD had a fairly strong negative population growth rate and small population size. Good *et al.* (2005) indicated the decline was continuing as evidenced by new information (Chipps Island trawl data). CCV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates.

(2) Viable Salmonid Population Summary for CCV Steelhead. The following summary has been compiled from the best available data and information on CV steelhead to provide a general synopsis of the viability parameters for this DPS.

Abundance. All indications are that natural California Central Valley steelhead have continued to decrease in abundance and in the proportion of natural fish over the past 25 years (Good *et al.* 2005); the
long-term trend remains negative. There has been little steelhead population monitoring, despite the recent monitoring on the San Joaquin River tributaries. Zimmerman *et al.* (2009) used otolith microchemistry to show that *O. mykiss* of anadromous parentage occur in all three major San Joaquin River tributaries, but at low levels, and that these tributaries have a higher percentage of resident *O. mykiss* compared to the Sacramento River and its tributaries.

Productivity. The Mossdale trawls on the San Joaquin River conducted annually by CDFG and USFWS capture steelhead smolts, although usually in very small numbers. These steelhead recoveries represent migrants from the Stanislaus, Tuolumne, and Merced rivers suggest that existing populations of CCV steelhead on these tributaries are severely depressed. In addition, the Chipps Island midwater trawl dataset from the USFWS provides information on the trend in the overall abundance of the CCV steelhead DPS (Williams *et al.* 2011). Updated through 2010, the trawl data indicate that the apparent decline in natural production of steelhead has continued since the 2005 status review. Catch-per-unit-effort has fluctuated over the past decade, but the proportion of the catch that is ad-clipped (100 percent of all hatchery produced steelhead have been ad-clipped since 1998) has steadily increased, exceeding 90 percent in recent years and reaching 95 percent in 2010 (Williams *et al.* 2011). Because hatchery releases have been fairly constant over the years, these data suggest that natural production of steelhead has been declining.

Spatial Structure. Steelhead have been confirmed in all of the tributaries of the San Joaquin River Basin: Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers. The efforts to provide passage of salmonids over impassable dams may increase the spatial diversity of California Central Valley steelhead populations if the passage programs are implemented for steelhead. In addition, the San Joaquin River Restoration Program (SJRRP) calls for a combination of channel and structural modifications along the San Joaquin River below Friant Dam, releases of water from Friant Dam to the confluence of the Merced River, and the reintroduction of spring-run Chinook salmon. If the SJRRP is successful, habitat improved for spring-run could also benefit CCV steelhead as well (NMFS 2011).

Diversity. Diversity, both genetic and behavioral, provides a species the opportunity to track environmental changes. CCV steelhead naturally experience the most diverse life history strategies of the listed Central Valley anadromous salmonid species. However, as the species' abundance decreases, and spatial structure of the DPS is reduced, it has less flexibility to track changes in the environment. CCV steelhead abundance and growth rate continue to decline, largely the result of a significant reduction in the diversity of habitats available to CCV steelhead (Lindley *et al.* 2006). The genetic diversity of CCV steelhead is also compromised by hatchery origin fish (such as the Mokelumne River Hatchery), which likely compromise the majority of the natural spawning run, placing the natural population a high risk of extinction (Lindley *et al.* 2007). Some genetic and behavioral variation is conserved in that in any given year, there are additional cohorts in the marine environment, and therefore, not expose to the same environmental stressors as their freshwater cohorts.

C. Factors Affecting the Species and Critical Habitat

Water development, water quality, over-harvesting, and disease and predation are some of the many issues affecting the decline of listed anadromous fish species in California. Hydropower, flood control, and water supply dams of the Federal Central Valley Project (CVP), State Water Project (SWP), and other municipal and private entities have permanently blocked or hindered salmonid historical spawning and rearing grounds. Clark (1929) estimated that originally there were 6,000 linear miles of salmon habitat in the Central Valley system and that 80 percent of this habitat had been lost by 1928. Yoshiyama *et al.* (1996) calculated that roughly 2,000 linear miles of salmon habitat was actually available before dam construction and mining, and concluded that 82 percent is not accessible today.

As a result of migrational barriers, spring-run Chinook salmon, and steelhead populations have been confined to lower elevation mainstems that historically only were used for migration. Higher temperatures at these lower elevations during late-summer and fall are a major stressor to adult and juvenile salmonids. Thus, population abundances have declined in these streams due to decreased quantity and quality of spawning and rearing habitat.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Central Valley. Thousands of small and medium-size water diversions exist along the Sacramento and San Joaquin Rivers, and their tributaries. Although efforts have been made in recent years to screen some of these diversions, many remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions entrain and kill many life stages of aquatic species, including juvenile salmonids and green sturgeon. For example, as of 1997, 98.5 percent of the 3,356 diversions included in a Central Valley database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001).

Levee development in the Central Valley affects spawning habitat, freshwater rearing habitat, freshwater migration corridors, and estuarine habitat primary constituent elements (PCEs). The construction of levees disrupts the natural processes of the river, resulting in a multitude of habitat-related effects. Many of these levees use angular rock (riprap) to armor the bank from erosion. The effects of channelization, and rip-rapping, include the alteration of river hydraulics and cover along the bank as a result of changes in bank configuration and structural features (Stillwater Sciences 2006). These changes affect the quantity and quality of near-shore habitat for juvenile salmonids and have been thoroughly studied (USFWS 2000; Schmetterling *et al.* 2001; Garland *et al.* 2002). Simple slopes protected with rock revetment generally create near-shore hydraulic conditions characterized by greater depths and faster, more homogeneous water velocities than occur along natural banks. Higher water velocities typically inhibit deposition and retention of sediment and woody debris. These changes generally reduce the range of habitat condition typically found along natural shorelines, especially by eliminating the shallow, slow-velocity river margins used by juvenile fish as refuge and escape from fast currents, deep water, and predators (Stillwater Sciences 2006).

Increased sedimentation resulting from agricultural and urban practices within the Central Valley is one of the primary causes of salmonid habitat degradation (NMFS 1996a). Sedimentation can adversely affect salmonids during all freshwater life stages by: clogging or abrading gill surfaces, adhering to eggs, hampering fry emergence (Phillips and Campbell 1961), burying eggs or alevins, scouring and filling in pools and riffles, reducing primary productivity and photosynthesis activity (Cordone and Kelley 1961), and affecting intergravel permeability and dissolved oxygen (DO) levels. Excessive sedimentation over time can cause substrates to become embedded, which reduces successful salmonid spawning and egg and fry survival (Waters 1995). In addition, urban storm water and agricultural runoff may be contaminated with pesticides, oil, grease, heavy metals, polycyclic aromatic hydrocarbons (PAHs), and other organics and nutrients (CRWQCB 1998) that can potentially destroy aquatic life necessary for salmonid and green sturgeon survival (NMFS 1996a,b). Point source (PS) and non-point source (NPS) pollution occurs in almost every area where urbanization activity influences the watershed. Impervious surfaces (*i.e.*, concrete, asphalt, and buildings) reduce water infiltration and increase runoff, thus creating greater flood hazard (NMFS 1996a,b). Flood control and land drainage schemes may increase the flood risk downstream by concentrating runoff. A flashy discharge pattern results in increased bank erosion with subsequent loss of riparian vegetation, undercut banks and stream channel widening. In addition to the PS and NPS inputs from urban runoff, juvenile salmonids and green sturgeon are exposed to increased water temperatures as a result of thermal inputs from municipal, industrial, and agricultural discharges.

These human activities have led to increased water temperatures, decreased DO levels, and increased turbidity and contaminant loads have degraded the quality of the aquatic habitat for the rearing and migration of salmonids. Most anthropogenic chemicals and waste materials including toxic organic and inorganic chemicals eventually accumulate in the sediment (Ingersoll 1995). Direct exposure to contaminated sediments may cause deleterious effects to listed salmonids. This may occur if a fish swims through a plume of the re-suspended sediments or rests on contaminated substrate and absorbs the toxic compounds through one of several routes: dermal contact, ingestion, or uptake across the gills. Elevated contaminant levels may be found in localized "hot spots" where discharge occurs or where river currents deposit sediment loads. Sediment contaminant levels can thus be significantly higher than the overlying water column concentrations (Environmental Protection Agency [EPA] 1994). However, the more likely route of exposure to salmonids is through the food chain, when fish feed on organisms that are contaminated with toxic compounds. Prey species become contaminated either by feeding on the detritus associated with the sediments or dwelling in the sediment itself. Therefore, the degree of exposure to the salmonids depends on their trophic level and the amount of contaminated forage base they consume. Response of salmonids to contaminated sediments is similar to water borne exposures.

Extensive ocean recreational and commercial troll fisheries for Chinook salmon exist along the Northern and Central California coast, and an inland recreational fishery exists in the Central Valley for Chinook salmon and steelhead. Ocean harvest of Central Valley Chinook salmon is estimated using an abundance index, called the Central Valley Index (CVI). The CVI is the ratio of Chinook salmon harvested south of Point Arena (where 85 percent of Central Valley Chinook salmon are caught) to escapement (adult spawner populations that have "escaped" the ocean fisheries and made it into the rivers to spawn). CWT returns indicate that Sacramento River salmon congregate off the California coast between Point Arena and Morro Bay.

In-river recreational fisheries historically have taken CV spring-run Chinook salmon throughout the species' range. During the summer, holding adult CV spring-run Chinook salmon are easily targeted by anglers when they congregate in large pools. Poaching also occurs at fish ladders, and other areas where adults congregate; however, the significance of poaching on the adult population is unknown. Specific regulations for the protection of CV spring-run Chinook salmon in Mill, Deer, Butte, and Big Chico creeks and the Yuba River have been added to the existing CDFG regulations. The current regulations, including those developed for Sacramento River winter-run Chinook salmon provide some level of protection for spring-run fish (CDFG 1998).

There is little information on steelhead harvest rates in California. Hallock *et al.* (1961) estimated that harvest rates for Sacramento River steelhead from the 1953-1954 through 1958-1959 seasons ranged from 25.1 percent to 45.6 percent assuming a 20 percent non-return rate of tags. The average annual harvest rate of adult steelhead above RBDD for the 3-year period from 1991-1992 through 1993-1994 was 16 percent (McEwan and Jackson 1996). Since 1998, all hatchery steelhead have been marked with an adipose fin clip allowing anglers to distinguish hatchery and wild steelhead. Current regulations restrict anglers from keeping unmarked steelhead in Central Valley streams. Overall, this regulation has greatly increased protection of naturally produced adult steelhead; however, the total number of CCV steelhead contacted might be a significant fraction of basin-wide escapement, and even low catch-and-release mortality may pose a problem for wild populations (Good *et al.* 2005).

Infectious disease is one of many factors that influence adult and juvenile salmonid survival. Salmonids are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment (NMFS 1996a, 1996b, 1998). Specific diseases such as bacterial kidney disease, *Ceratomyxosis shasta* (C-shasta), columnaris, furunculosis, infectious hematopoietic necrosis, redmouth and black spot disease, whirling disease, and erythrocytic inclusion body syndrome are known, among others, to affect steelhead and Chinook salmon (NMFS 1996a, 1996b, 1998). Very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases; however, studies have shown that wild fish tend to be less susceptible to pathogens than are hatchery-reared fish. Nevertheless, wild salmonids may contract diseases that are spread through the water column (*i.e.*, waterborne pathogens) as well as through interbreeding with infected hatchery fish. The stress of being released into the wild from a controlled hatchery environment frequently causes latent infections to convert into a more pathological state, and increases the potential of transmission from hatchery reared fish to wild stocks within the same waters.

Accelerated predation also may be a factor in the decline of listed salmonids. Human-induced habitat changes such as alteration of natural flow regimes and installation of bank revetment and structures such as dams, bridges, water diversions, piers, and wharves often provide conditions that both disorient juvenile fish and attract predators (Stevens 1961; Decato 1978; Vogel *et al.* 1988; Garcia 1989). On the mainstem Sacramento River, high rates of predation are known to occur at the RBDD, Anderson-Cottonwood Irrigation District's (ACID) diversion dam, GCID's diversion facility, areas where rock revetment has replaced natural river bank vegetation, and at South Delta water diversion structures (*e.g.*, Clifton Court Forebay; CDFG 1998). In passing the dam, juveniles are subject to conditions which greatly disorient them, making them highly susceptible to predation by fish or birds. Sacramento pikeminnow (*Ptychocheilus grandis*) and striped bass (*Morone saxatilis*) congregate below the dam and prey on juvenile salmon in the tail waters. The Sacramento pikeminnow is a species native to the Sacramento River basin and has co-evolved with the anadromous salmonids in this system. However, rearing conditions in the Sacramento River today (e.g. warm water, low-irregular flow, standing water, and water diversions) compared to its natural state and function decades ago in the pre-dam era, are more conducive to warm water species such as Sacramento pikeminnow and striped bass than to native salmonids.

For listed salmonids , the construction of high dams for hydropower, flood control, and water supply resulted in the loss of vast amounts of upstream habitat (*i.e.*, approximately 80 percent, or a minimum linear estimate of over 1,000 stream miles), and often resulted in precipitous declines in affected populations. For example, the completion of Friant Dam in 1947 has been linked with the extirpation of spring-run Chinook salmon in the San Joaquin River upstream of the Merced River within just a few years. The reduced populations that remain below Central Valley dams are forced to spawn in lower elevation tailwater habitats of the mainstem rivers and tributaries that were previously not used for this purpose. This habitat is entirely dependent on managing reservoir releases to maintain cool water temperatures suitable for spawning, and/or rearing. This requirement has been difficult to achieve in all water year types and for all life stages of affected species. CCV steelhead, in particular, seem to require the qualities of small tributary habitat similar to what they historically used for spawning; habitat that is largely unavailable to them under the current water management scenario. All salmonid species considered in this consultation have been adversely affected by the production of hatchery fish associated with the mitigation for the habitat lost to dam construction (e.g., from genetic impacts, increased competition, exposure to novel diseases, etc.).

Long-term climate change is an additional consideration regarding the viability of the CV spring-run Chinook salmon ESU and specific populations in the long-term. Global and localized climate changes, such as El Nino ocean conditions and prolonged drought conditions, may play an important role in the suitability of spring-run Chinook salmon habitat and, hence, viability. The CV spring-run Chinook salmon ESU is highly vulnerable to drought conditions (NMFS 2009). An alarming prediction is that Sierra snow packs are expected to decrease with global warming and that the majority of runoff in California will be from rainfall in the winter rather than from melting snow pack in the mountains (CDWR 2006). This will alter river runoff patterns and transform the tributaries that feed the Central Valley from a spring/summer snowmelt dominated system to a winter rain dominated system. It can be hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival. The cold snowmelt that furnishes the late spring and early summer runoff will be replaced by warmer precipitation runoff. This should truncate the period of time that suitable cold-water conditions exist below existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold-water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures below reservoirs, such as Shasta Lake and Lake Oroville, potentially could rise above thermal tolerances for juvenile and adult salmonids (*i.e.* Central Valley steelhead) that must hold below the dam over the summer and fall periods. Increased winter precipitation, decreased snow pack, and permafrost degradation could affect the flow and temperature of rivers and streams, with negative impacts on fish populations and the habitat that supports them.

IV. ENVIRONMENTAL BASELINE

The environmental baseline "includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 CFR §402.02).

A. Status of the Species and Critical Habitat within the Action Area

1. <u>Status of the Species within the Action Area</u>

The action area is located near the city of Fresno, California on the upper reach of the San Joaquin River. It is located approximately 20 miles downstream from Friant Dam. Currently status-species fish have not been viewed as having access to this section of the San Joaquin due to the Hills-Ferry Barrier located at the confluence of the San Joaquin and Merced rivers and previously dry and barren conditions for the most part prior to 2009. It is thought though, that during high flows and other times of the year when the barrier is removed the CCV steelhead would have had access to the action area. CV spring-run Chinook salmon, as requisite with the SJRRP, is set to be in this portion of the river before December 31, 2012. The action area is also expected to provide spawning and rearing habitat for juveniles of these species.

Following is a status summary of these species and their habitat within the San Joaquin River and action area.

a. *CV spring-run Chinook Salmon*

The action area currently contains no known CV spring-run Chinook salmon. CV spring-run Chinook salmon are anticipated to be released below Friant Dam, no later than December 31, 2012, according to the NRDC, *et al.*, v. Kirk Rodgers, *et al.* 2006 settlement which was the basis for the SJRRP.

Based on historical run-time observations of spring-run Chinook salmon in the San Joaquin River basin, adults are likely to be present in the action area during the upstream migration period between May and September, when they are migrating to upstream holding and spawning habitat. Spring-run Chinook salmon probably migrate downstream throughout the year, dispersing downstream as fry soon after emergence; early in their first summer as fingerlings; in the fall as flows increase; or after overwintering in freshwater as yearlings (Healey 1991).

b. *CCV steelhead*

Only historical information for the upper San Joaquin River exists regarding the abundance, location, and timing of steelhead spawning. However, in other drainage basins they are usually more widely distributed than Chinook salmon, and likely spawned and reared in tributaries above Friant Dam (Yoshiyama *et al.* 1996, Voight and Gale 1998, as cited in McEwan 2001). It is very likely that management of the mainstem San Joaquin River flows that is designed to restore Chinook salmon populations will provide adequate flows to support the upstream and downstream migration of steelhead, and may improve mainstem rearing habitat for steelhead as well. While migrating CCV steelhead may occur within the action area during the rainy season, adult presence is unlikely during the summer months. Rearing and migrating juveniles are likely to be present in the action area year around.

2. <u>Status of Critical Habitat within the Action Area</u>

The action area (*i.e.*, upper San Joaquin River) has the potential to provide spawning and rearing habitat for CCV spring-run Chinook salmon and CCV steelhead with the implementation of the SJRRP. The action area is currently not designated critical habitat for CCV spring-run Chinook salmon or CCV steelhead. Habitat requirements for CV spring-run Chinook salmon and CCV steelhead within the action include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

B. Factors Affecting the Species in the Action Area

Interim flow water releases began from Friant Dam into the San Joaquin River on October 1, 2009. Flows from Friant have been continuous since then, but have fluctuated in terms of velocity in preparation for the reintroduction of CV spring-run Chinook salmon as mandated by the SJRRP. It is anticipated that the magnitude and duration of peak flows in the San Joaquin River during the winter and spring will be reduced by water impoundment upstream behind Friant Dam. Instream flows during the summer and early fall months will fluctuate due to deliveries of municipal and agricultural water supplies. Overall, water management reduces natural variability by creating more uniform flows year-round.

High summer water temperatures can create a thermal barrier to the migration of adult and juvenile salmonids (Kjelson *et al.* 1982; Rich 1997). Although cooler water is anticipated in the direct action area due to the proximity to Friant Dam, ambient air temperature in the summer months can be extreme causing fluctuations in the watershed. Water diversions, for agricultural and municipal purposes are found throughout the San Joaquin River and entrain and kill juvenile and salmon and steelhead during emigration periods during fall, winter, and spring months.

Little is known about other factors, such as the quantity of macro invertebrates in the action area or appropriate rearing substrate, due to this portion of the river being mostly void of water for nearly 50 years.

C. Likelihood of Species Persistence in the Action Area

With the implementation of the SJRRP, the likelihood of CCV steelhead and CV spring-run Chinook salmon in the action area are very promising. Historically this area proved more than suitable for these species, and it is expectant that as the SJRRP continues its work and monitoring in the area that the species will begin to show increases in their populations again.

V. EFFECTS OF THE ACTION

Pursuant to Section 7(a)(2) of the ESA (16 U.S.C. §1536), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This biological opinion assesses the effects of the California High Speed Train: Merced to Fresno section on CV spring-run Chinook salmon and CCV steelhead. The proposed HST project is likely to adversely affect listed species through vibration from pile driving of the permanent piles for the new high speed train bridge and temporary sheet piles for the coffer dam and false work if needed. In the *Description of the Proposed Action* section of this Opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this biological and conference opinion, NMFS provided an overview of the threatened and endangered species and critical habitat that are likely to be adversely affected by the activity under consultation.

Regulations that implement section 7(b)(2) of the ESA require NMFS to evaluate the direct and indirect effects of Federal actions and actions that are interrelated with or interdependent to the Federal action to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of both surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. §1536; 50 CFR 402.02).

A. Approach to the Assessment

NMFS generally approaches "jeopardy" analyses in a series of steps. First, NMFS evaluates the available evidence to identify direct and indirect physical, chemical, and biotic effects of the proposed actions (these effects include direct impacts to a species habitat; modifications to something in the species' environment - such as reducing a species' prey base, enhancing populations of predators, altering its spawning substrate, altering its ambient temperature regimes; or adding something novel to a species' environment - such as introducing exotic competitors or disruptive noises). Once NMFS has identified the effects of the action, the available evidence is evaluated to identify a species' likelihood and extent of exposure to any adverse effects caused by the action (*i.e.* the extent of spatial and temporal overlap between the species and the effects of the action). Once NMFS has identified the level of exposure that a species will have to the effects of the action, the available evidence is evaluated to identify the species' probable response, including physical and behavioral reactions, to these effects. These responses then will be assessed to determine if they can reasonably be expected to reduce a species' reproduction, numbers, or distribution (for example, by changing birth, death, immigration, or emigration rates; increasing the age at which individuals reach sexual maturity; decreasing the age at which individuals stop reproducing; among others). The available evidence is then used to determine if these reductions, if there are any, could reasonably be expected to appreciably reduce a species' likelihood of surviving and recovering in the wild.

1. Information Available for the Assessment

To conduct the assessment, NMFS examined an extensive amount of evidence from a variety of sources. Detailed background information on the status of these species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, governmental and non-governmental reports, previous biological opinions, documents evaluating the effects of underwater noise from pile driving, the biological assessment for this project, and project meeting notes. Additional information investigating the effects of the project's actions on the listed species in question, their anticipated response to these actions, and the environmental consequences of the actions as a whole was obtained from the aforementioned resources. For information that has been taken directly from published, citable documents, those citations have been referenced in the text and listed at the end of this document.

2. Assumptions Underlying This Assessment

In the absence of definitive data or conclusive evidence, NMFS must make a logical series of assumptions to overcome the limits of the available information. These assumptions will be made using sound, scientific reasoning that can be logically derived from the available information. The progression of the reasoning will be stated for each assumption, and supporting evidence cited.

The potential adverse effects to listed species resulting from the proposed construction of the HST and the implementation of the mitigation features are primarily associated with elevated underwater sound pressure levels generated during pile driving. However, other potential impacts to listed salmonids include turbidity resulting from ground disturbance for areas associated with bridge construction and mitigation.

The information used in this assessment includes the Status of the Species and Environmental Baseline sections of this biological opinion, studies and accounts of the impacts of construction and pile driving activities on anadromous fish.

B. Assessment

The proposed HST project includes actions that may adversely affect several life stages of listed fish species. Adverse effects to these species and their habitat may result from changes in water quality from construction activities, loss of riparian vegetation from construction activities, and physical injury and harassment of juveniles and adults from exposure to elevated levels of underwater sound produced during pile driving. The project includes integrated design features to avoid and minimize many of these potential impacts.

As described in the environmental baseline, adult CCV steelhead enter freshwater to spawn between August to January with a peak migration period of September-October (Moyle 2002). The steelhead migration period overlaps the pile driving in-water work window (June 15-October 15. CV spring-run Chinook salmon historically entered the San Joaquin River from May through September and spawn in the autumn. Spring-run Chinook salmon probably migrate downstream throughout the year, dispersing downstream as fry soon after emergence; early in their first summer as fingerlings; in the fall as flows increase; or after overwintering in freshwater as yearlings (Healey 1991).

1. Pile Driving and Bridge Construction

The installation of steel piles with a vibratory hammer in the San Joaquin River is expected to result in adverse effects to exposed fish due to possibly high levels of underwater sound that will be produced. Adverse effects can range from physical injury to the exposed fish, sometimes resulting in death, to lesser impacts, such as behavioral modifications or increased susceptibility to predation, which do not necessarily result in death or long term adverse impacts by themselves. The degree to which an individual fish exposed to underwater sound will respond (from a startle response to immediate mortality) is dependent on a number of variables such as the species of fish, size of the fish, presence of a swimbladder, sound pressure intensity and frequency, shape of the sound wave (rise time), depth of the water around the pile and the bottom substrate composition and texture. Swimbladders, which are inflated with gas, can expand rapidly as the pressure waves pass through the fish and can press against, and strain, adjacent organs, such as the liver and kidney (Keevin and Hempen 1997). In addition, this pneumatic compression causes demonstrable injury, in the form of ruptured capillaries, internal bleeding, and maceration of highly vascular organs (Caltrans 2002). Hastings and Popper (2005) also noted that sound waves can cause different types of tissues to vibrate at different frequencies, and that this differential vibration can cause tearing of mesenteries and other sensitive connective tissues. Exposure to high noise levels can also lead to injury through "rectified diffusion," the formation and growth of bubbles in tissues. These bubbles can cause inflammation, cellular damage, and blockage or rupture of capillaries, arteries, and veins (Crum and Mao 1996; Stroetz *et al.* 2001; Vlahakis and Hubmayr 2000). Death from barotrauma and rectified diffusion injuries can be instantaneous, or delayed for minutes, hours or even days after exposure.

NMFS is uses a single strike peak sound pressure level (SPL) of 206 dB and an accumulated sound exposure level (SEL) of 187 dB to correlate underwater sound with potential injury to fish. These are the thresholds that indicate the onset of physical injury. The SPL is an expression of the sound pressure using the decibel scale and the standard reference pressures of micro-Pascal

(1 μPa) for water and biological tissues. SEL is the exposure of fish to a total amount of energy (*i.e.*, dose) that can be used to determine a physical injury response. In other words, it is the time-integrated, sound-pressure-squared level. Because sound is a form of energy, the damage potential of a given sound environment will depend not only on its level, but also its duration. The root-mean-square (RMS) is 150 dB for a behavioral response in a fish. The level is determined by analyzing the waveform and computing the square root of the average of the squared pressures over the time period that comprises that portion of the waveform containing 90% of the sound (pressure squared) energy (Hastings and Popper 2005). This calculated RMS SPL is described as "RMS (impulse)" and is used to report an overall average SPL for a single pile driving pulse (Hastings and Popper 2005). Because all SEL measurements are normalized to a one second time interval, it may be used to compare the energy content of different exposures to sound. SEL is calculated by summing the cumulative pressure squared (p2) over time and is often used as an indication of the energy dose. The following table summarizes the criteria for injury to fish from underwater sound generated 10 meters (source level) from the pile driving (Table 4).

Table 4. Summary of interim criteria for injury to fish assuming a distance of 10 meters (source level from the driven pile).

Interim Criteria for Injury	Interim Criteria in Decibels (dB)	Fish Response
Peak	206 dB	physical injury
Cumulative SEL	187 dB (for fish 2 grams or larger); 183 dB (for fish less than 2 grams)	physical injury
Root Mean Square (RMS)	150 dB	behavioral response

The proposed project includes installation of up to 2 CIDH piles near the low flow channel of the San Joaquin River and possibly temporary pipe piles to hold temporary work trestles if need be. To reduce the likelihood of exposure to underwater noise levels, trestle and temporary bent pile installation will not begin until June 15, while installation of the CIDH piles are limited from July 15 through October 1. A coffer dam will be used for the near-water piles. This cofferdam will reduce the potential for higher sound, by allowing work to be done on more solid substrate, allowing for less vibration and impact than would have occurred in a more liquid substrate. This timing window allows in-water work to occur when the numbers of listed fish in the action area are at their lowest, and the life stages of listed fish are less vulnerable (*i.e.* larger and able to avoid the action area) to the potential effects.

The noise assessment prepared by the FRA/HSRA in the BA, breaks down the impacts from driving the permanent and temporary impacts. Peak sound levels would not exceed the interim criteria of 206 dB, and the accumulated SEL criteria of 187 dB for adults and 183dB for juveniles would not be exceeded to all extent feasible. Pile driving will be conducted only during daylight hours and initially will be used at low energy levels and reduced impact frequency. Applied energy and frequency will be gradually increased until necessary full force and frequency are achieved. If temporary support structures are needed it is only expected to take 3-4 days to install. A conservative estimate for total bridge completion is two NMFS authorized work windows for near water work. The activities related to pile driving are temporary and will only last a short time during the duration of the in-water work activities. Sublethal and/or subinjurious effects to juvenile CV spring-run Chinook salmon and CCV steelhead, including altered behavior, auditory masking, and temporary hearing threshold shifts can affect vulnerability to predation, foraging success, and other factors that influence survival and fitness. Because daily pile driving activities will be separated by overnight rest periods when migration can precede uninhibited, upstream migration of listed fish are not expected to be significantly delayed. More extreme effects, including injury and mortality of migrating adults, could potentially occur during limited unattenuated pile driving. These effects will be limited to isolated, individual events at the beginning of project and the actual potential for listed fish to be exposed to an accumulated 187 dB SEL is relatively low due to the project location and the time period when construction will occur. The expected populations of CV spring-run Chinook salmon and CCV steelhead in the San Joaquin River represent a small number of the entire population in the Central Valley, and the action is expected to have little impact upon the entire ESU and DPS. There is potential for adult CV spring-run Chinook salmon and CCV steelhead to be adversely effected from pile driving activities, however, it is expected to be relatively low due to their larger bodies. In addition, pile driving activities would only occur in the daytime which will avoid crepuscular and nocturnal periods when salmonid migration is more common. Furthermore, use of a vibratory hammer instead of an impact hammer should lessen potential impacts even further.

2. Water Quality

NMFS anticipates that some local increases in turbidity will result as a consequence of these actions. The increases in local turbidity levels are associated with the re-suspension of bottom sediments during the piling installation phase of the construction process. The proposed in-water construction activities are not expected to lead to significant impacts to water quality in the action area. There are expected to be minor, short term increases in turbidity and sedimentation in localized areas due to the driving and removal of temporary piles. The expected increases in turbidity and suspended sediment may disrupt feeding and migratory behavior of listed fish over a small area for a short period of time. The turbidity associated with installation and removal of piles could result in localized displacement and likely behavioral modifications to individual salmonids if they do not readily move away from the areas directly affected by the project.

These temporary behavioral changes are not expected to result in injury or death of listed salmonids. NMFS does not anticipate that turbidity levels associated with the pile driving will increase to deleterious levels. Furthermore, turbidity conditions are expected to return to ambient levels within a couple of days to hours of the termination of pile driving actions.

Unanticipated spills into the San Joaquin River, such as toxic substances used at construction sites (gasoline and lubricants) can lead to adverse effects and mortality in juvenile and adult salmonids. If these toxins seep into the water, these substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality. However, NMFS expects that the FRA and HSRA will adhere to the standard BMP's and SWPPP during construction activities to minimize or prevent these kinds of effects on listed salmonids. Therefore, NMFS does not expect the HST project will result in water contamination that will injure or kill listed anadromous fish.

3. Operations Phase

The HST is a passenger train and will not carry cargo composed of hazardous material. The train would be powered by an electrical current and thus would not emit fuels (i.e. oil, gasoline, etc.). There is not literature suggesting a negative effect to anadromous fish due to overhead power lines. In the unlikely event of a derailment, there would not be a risk to the environment from hazardous chemicals or materials. There is a potential for pollution from maintenance equipment or vehicles utilized along the HST primary right-of-way to leak and be redirected due to storm water runoff. The run-off however, would be directed as sheet flow into the adjacent drainage system or directed through swales to infiltration basins. The basins are designed as a water quality control measure. No runoff from the Merced to Fresno section would be discharged directly to any surface water bodies. Runoff from bridges, overpasses, underpasses, and aerial structures would be collected and discharged to infiltration basins or adjacent drainage systems. These potential effects are indirect, but have the possibility to occur for the duration the HST is operable.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The HST Merced to Fresno section will construct a new bridge just east of the existing UPRR and SR99 bridge. Land surrounding the HST proposed project has two distinct settings. The first setting is where the new bridge will be located, which is within the confines of the San Joaquin River flood channel. Within the channel is open space designated as part of the Department of Fish and Games and San Joaquin Parkway and River Trust Camp Pashayne ecological reserve. The second environmental setting is outside of the river channel and consists of agricultural fields to the north and the city of Fresno to the south.

Federal actions that may affect the action area include the SJRRP, which is scheduled to have CV spring-run Chinook salmon below Friant Dam by December 31, 2012. Monitoring of this program is supposed to continue extensively through 2025 and then be reevaluated at this time.

There are no specific plans for further development within the action area of the proposed project at this time. Therefore, further cumulative effects beyond those described above are not expected.

VII. INTEGRATION AND SYNTHESIS

This section integrates and adds the current conditions described in the status of the species and the environmental baseline for the action area with the effects of the proposed action and the cumulative effects of future actions. The purpose of this synthesis is to review the effects of the action in addition to the environmental baseline to understand how the action will affect the likelihood of the species' continued survival.

A. Summary of Status of the Species and Environmental Baseline

1. <u>CV spring-run Chinook salmon</u>

Historically, the majority of spring-run in the Central Valley were produced in the Southern Sierra Nevada Diversity Group, which contains the San Joaquin River and its tributaries. All spring-run populations in this diversity group have been extirpated (Lindley *et al.* 2007). Lindley *et al.* (2007) determined that perhaps 15 of the 19 historical populations of spring-run are extinct, with their entire historical spawning habitats behind various impassable dams. Those authors only considered Butte, Deer, and Mill creeks as watersheds with persistent populations of Chinook salmon known as spring-run, although they recognized that phenotypic Chinook salmon persist within the FRH population spawning in the Feather River below Oroville Dam and in the Yuba River below Englebright Dam. All of those population fall within the Northern Sierra Nevada diversity group. Butte and Deer creek spring-run populations are at low risk of extinction, and the Mill Creek population is at either a moderate or low risk (Lindley *et al.* 2007). Viable CV spring-run Chinook salmon populations occur in only one of four diversity groups that historically contained them, and therefore fail the representation and redundancy rule for ESU viability (Lindley *et al.* 2007). Because the CV spring-run Chinook salmon ESU is spatially confined to relatively few remaining streams, continues to display broad fluctuations in abundance, and a large proportion of the population (*i.e.*, in Butte Creek) faces the risk of high mortality rates, the ESU remains at a moderate to high risk of extinction.

Past and present impacts within the Sacramento River basin have caused significant loss of habitat. Populations have declined drastically over the last century, and some subpopulations have been extirpated. The construction of dams has limited access to a large and significant portion of historical spawning and rearing. Dam operations have changed downstream flow patterns, effecting stream dynamics (*i.e.* geomorphology, habitat configuration, etc.), and affected available habitat through changes in water temperature characteristics, limiting gravel recruitment to available spawning reaches and limiting the introduction of LWM which contributes to habitat diversity.

Despite the currently non-existent genetic status of the San Joaquin River population, and the substantial reduction in habitat availability and suitability since the construction of Friant Dam, the value of the upper San Joaquin River basin as prime spawning and habitat areas, its projected location as the southern-most extant population of spring-run Chinook salmon, and its suitability for such make it an important node of habitat for the survival and recovery of the species.

2. CCV steelhead

CCV steelhead historically were well-distributed throughout the Sacramento and San Joaquin Rivers (Busby *et al.* 1996) and were found from the upper Sacramento and Pit River systems (now inaccessible due to Shasta and Keswick Dams) south to the Kings and possibly the Kern river systems, and in both east- and west-side Sacramento River tributaries (Yoshiyama *et al.* 1996). Lindley *et al.* (2006) estimated that historically there were at least 81 independent CCV steelhead populations distributed primarily throughout the eastern tributaries of the Sacramento and San Joaquin rivers. This distribution has been greatly affected by dams (McEwan and Jackson 1996). Presently, impassable dams block access to 80 percent of historically available habitat, and block access to all historical spawning habitat for about 38 percent of historical populations (Lindley *et al.* 2006).

Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill creeks and the Yuba River. Populations may exist in Big Chico and Butte creeks and a few wild steelhead are produced in the American and Feather rivers (McEwan and Jackson 1996). Snorkel surveys done in 1999 to 2002 indicate that steelhead are present in Clear Creek (Newton 2002). Because of the large resident *O. mykiss* population in Clear Creek, steelhead spawner abundance has not been estimated.

Spatial structure for steelhead is fragmented and reduced by elimination or significant reduction of the major core populations (*i.e.* Sacramento River, Feather River and American River) that provided a source for the numerous smaller tributary and intermittent stream populations like Dry Creek, Auburn Ravine, Yuba River, Deer Creek, Mill Creek, and Antelope Creek. Tributary populations can likely never achieve the size and variability of the core populations in the long-term, generally due to the size and available resources of the tributaries.

Lindley *et al.* (2007) indicated that prior population census estimates completed in the 1990s found the CCV steelhead spawning population above RBDD had a fairly strong negative population growth rate and small population size. Good *et al.* (2005) indicated the decline was continuing as evidenced by new information (Chipps Island trawl data). CCV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of CCV steelhead is uncertain due to limited data concerning their status. However, Lindley *et al.* (2007) concluded that there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction.

Despite the substantial reduction in habitat availability and suitability since the construction of Friant Dam, the value of the upper San Joaquin River with the implementation of the SJRRP is expected to create greater spawning and rearing habitat making it an important node of habitat for the survival and recovery of the species.

B. Summary of the Effects of the Proposed Action on Listed Species Likelihood of Survival and Recovery

Under the proposed HST project, adverse impacts to listed species stemming from increased sedimentation, use of a cofferdam, and acoustic impacts from pile driving are expected to occur. Even though these impacts may cause physiological stress to the extent that the normal behavior patterns (e.g., feeding, sheltering and migration) of affected individuals may be disrupted, due to the timing of pile driving activities, the overall changes in turbidity and suspended sediment associated with this project are not expected to adversely affect listed species. These impacts are primarily low-level, short-term alteration of habitat conditions. Potential impacts are expected to be minimized by meeting California Central Valley Regional Water Quality Control Board (CVRWQCB) water quality objectives, implementing BMPs for erosion control, implementing the fish rescue plan inside the cofferdam, staging equipment outside of the riparian corridor, limiting the amount of riparian vegetation removal, and restoring disturbed riparian habitat values at the project site. It is also unlikely during this period of pile driving activities that adults of either species aforementioned will be present.

Pile driving activities are scheduled to occur June 15-October 1. Elevated levels of underwater sound around the pile driving activities may cause temporary behavioral changes, loss or reduction of hearing in affected fish, and/or mortality to listed fish. These impacts will be substantially minimized by the pile driving work window restriction and by using an attenuation casing for vibratory hammer-driven temporary piles 24-inches or greater in diameter during the period of June 15-July 14. Loss of short-term hearing sensitivities in juvenile fish will expose them to higher risks of predation. Fish with impacted hearing capacities will have a lower ability to detect predators and may be unable to maintain position in the water column (inner ear equilibrium factors). NMFS believes that this limited exposure to underwater sound levels that would cause behavioral effects, injury, and/or mortality is unlikely to significantly affect growth or survival of exposed adult and juvenile salmonids. Construction lapses, including daily breaks and nighttime non-working periods, as well as long periods when no pile driving is scheduled to occur, will allow fish to migrate through the action area and minimize the extent of impacts to survival and recovery of salmonid populations. In addition, a low proportion of the population of fish in the San Joaquin River will be exposed to the pile driving activities.

1. <u>CV spring-run Chinook salmon</u>

The new HST bridge over the San Joaquin River will be a permanent structure. However, this will not impede listed anadromous fish, such as spring-run Chinook salmon rearing and migration. The construction of the new HST bridge is temporary and the pile driving effects on fish will only last as long as the duration of two summer seasons. In addition, piles will be placed outside the wetted river channel. Therefore, adverse effects to spring-run Chinook salmon are expected to occur only during the seasonal in-water work window. These adverse effects will not appreciably reduce the likelihood of survival and recovery of the CV spring-run Chinook salmon. Injury to Chinook salmon will be at a peak single strike peak sound pressure level (SPL) of 206 dB, 10 meters from the pile driving, between June 15 and October 1. Mortality is expected if sound levels reach above cumulative SEL 187 dB during June 15 to October 1. However, fish presence in the action area is expected to be low. It is expected that the effects of the proposed project, when considered in the context of the current baseline and likely future cumulative effects, would not appreciably reduce the likelihood of survival and recovery of the CV spring-run Chinook salmon ESU throughout its range.

2. <u>CCV steelhead</u>

NMFS anticipates that the proposed project will result in the exposure of a small number of adult and juvenile CCV steelhead to increased levels of turbidity and suspended sediment, as well as noise from pile driving activities. The exposure to noise in particular is expected to adversely affect a small number of individuals. During June 15 to October 1, noise from pile driving may delay or impede fish migration causing increased energy expenditure by affected individuals, but as single strike sound pressure levels are not expected to exceed 206 dB and SEL of 187 dB, no direct mortality of juvenile or adult fish is expected at 10 meters from the piles.

The elevated stress levels may degrade the fish's health and the reproductive potential of adults, and increase the potential of juveniles to be preyed upon by striped bass or other large predators due to impaired behavioral and physiological responses. Individuals that appear different in their behavior attract predators, and thus experience higher mortality due to predator attacks. Even so, given the low level of exposure expected to result from adherence to the limited seasonal and diurnal in-water work windows, the limited adverse response expected from the few individuals of the San Joaquin River population that are exposed to these adverse effects, and the relatively small contribution to juvenile production that the upper San Joaquin River provides to the overall population numbers for the CCV steelhead DPS, it is expected that the effects of the proposed project, when considered in the context of the current baseline and likely future cumulative effects, would not appreciably reduce the likelihood of survival and recovery of the CCV steelhead DPS throughout its range.

C. Summary of Effects of the Proposed Action on Critical Habitat

The location of the action area is not currently considered critical habitat.

VIII. CONCLUSION

After reviewing the best scientific and commercial data available, including the environmental baseline, the effects of the proposed project, and the cumulative effects, it is NMFS biological opinion that the HST Merced to Fresno is not likely to jeopardize the continued existence of threatened CV spring-run Chinook salmon or threatened CCV steelhead.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the FRA and HSRA, as appropriate, for the exemption in section 7(o)(2) to apply. The FRA and the HSRA has a continuing duty to regulate the activity covered by this incidental take statement. If the FRA and the HSRA (1) fail to assume and implement the terms and conditions or (2) fail to require any contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contract, permit or grant documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the HSRA must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement [50 CFR §402.14(i)(3)].

A. Amount or Extent of Take

NMFS anticipates incidental take of CV spring-run Chinook salmon and CCV steelhead from impacts directly related to pile driving and cofferdam activities and impairment of essential behavior patterns as a result of these activities. The incidental take is expected to be in the form of harm, harassment, or mortality of CV spring-run Chinook salmon and CCV steelhead, resulting from the installation and removal of temporary and permanent piles, the installation of a cofferdam and the dewatering associated with it, as well as periodic maintenance checks on the piers in the form of dive/snorkel surveys. Incidental take is expected to occur for two in-water work window seasons, from June 15 through October 15 (over the course of two years), when individuals of CV spring-run Chinook salmon and CCV steelhead could potentially be in the action area. Take is expected to be limited to migrating adults, and migrating, rearing and smolting juveniles.

NMFS cannot, using the best available information, quantify the anticipated incidental take of individual CV spring-run Chinook salmon and CCV steelhead because of the variability and uncertainty associated with the population size of each species, annual variations in the timing of migration, and uncertainties regarding individual habitat use of the project area. In lieu of such quantification, NMFS has identified ecological surrogates containing parameters that define the acceptable take level.

<u>Ecological Surrogates</u>

1. The number of salmonids that may be incidentally taken during activities is expected to be small. NMFS will use the area of sound pressure wave impacts extending into the water column from each pile, and the time period for pile driving as a surrogate for number of fish. The analysis of the effects of the

proposed project anticipates that the construction of the false work would require driving 35 steel, 2 foot diameter piles over roughly 7 to 10 days (approximately 30 minutes driving time per pile using a vibratory hammer, with 5 piles driven during an 8 hour work day), and the installation of the new bridge's permanent structure will require placing 2 CIDH piles over a period of 15 days, adding up to a total of between 22 and 25 days of pile driving over a period of 4 months (June 15 through October 15). If the FRA/HSRA monitoring indicates that sound pressure levels greater than 206 dB peak, or 187 dB SEL, extend beyond these periods the amount of incidental take may be exceeded.

2. Take in the form of mortality of stranded juvenile CCV steelhead and CV spring-run Chinook salmon during the dewatering activities from June 15 to October 15. Take will be a small percentage of the relocated (salvaged) CCV steelhead and CV spring-run Chinook salmon juveniles. There is potential for listed juvenile fish to be directly killed or injured as a result of the fish salvage. A low mortality rate (expected to be less than 10 percent if consistent with the results of fish handling in similar fish salvage efforts) is expected from capturing and handling. Fish that are captured and released may temporarily become startled or stressed. Fish salvage operations should minimize the number of juveniles lost, but it is anticipated that some mortality may occur.

3. The analysis of the effects of the proposed project anticipates that the turbidity levels produced by installation/removal of piles will not exceed those permitted under the project SWPPP and that if turbidity levels approach or exceed the acceptable criteria established by the Regional Water Quality Control Board (CRWQCB), construction activities will be halted until turbidity levels return to within acceptable levels.

If these ecological surrogates are not met and maintained, the proposed project will be considered to have exceeded anticipated take levels, thus requiring FRA/HSRA to coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels. Anticipated incidental take will be exceeded if the criteria described above are not met, the Project is not implemented as described in the Biological Assessment (BA) prepared for this project, all conservation measures are not implemented as described in the BA (including successful completion of monitoring and reporting criteria), or the project is not implemented in compliance with the terms and conditions of this incidental take statement. If take is exceeded formal consultation must be reinitiated (50 C.F.R. § 402.16(a)).

B. Effect of Take

NMFS has determined that the level of take resulting from the construction of the proposed project is not likely to jeopardize the continued existence of CV spring-run Chinook salmon or CV steelhead.

C. Reasonable and Prudent Measures

NMFS has determined that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the incidental take of listed anadromous fish.

1. Measures shall be taken to minimize the amount and duration of pile driving and its potential impacts on listed salmonids, and to monitor the range and magnitude of compression shock waves generated by pile driving operations.

2. Measures shall be taken to maintain, monitor, and adaptively manage all conservation measures throughout the life of the project to ensure their effectiveness.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the FRA and HSRA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary:

1. Measures shall be taken to minimize the amount and duration of pile driving and its potential impacts on listed salmonids, and to monitor the range and magnitude of compression shock waves generated by pile driving operations.

    - The FRA and HSRA shall monitor underwater sound during all vibratory hammer pile driving activities on land or in water. If underwater sound produced on a single day exceeds the maximum allowable level of single strike 206 dB peak at 10 meters from the pile being installed or SEL 187 dB, then NMFS must be contacted within 24 hours.

    - Pile driving shall occur only during daylight hours from one hour after sunrise to one hour before sunset. This is to ensure that pile driving does not occur at dawn or dusk, during peak salmonid migration and feeding times.

2. Measures shall be taken to minimize the amount of "take" during cofferdam instillation and dewatering activities.

    - NMFS anticipates incidental take of juvenile CV spring-run Chinook salmon and CCV steelhead from impacts directly related to dewatering activities. The incidental take is expected to be in the form of harm or mortality of juvenile CV spring-run Chinook salmon and CCV steelhead resulting from seining and electrofishing. Take is expected to be limited to migrating, rearing and smolting juveniles. Take in the form of mortality of stranded juvenile CV steelhead and CV spring-run Chinook salmon during the dewatering activities from June 15 to October 15 shall be less than 10 percent of the relocated (salvaged) CV steelhead and CV spring-run Chinook salmon juveniles. Fish salvage operations should minimize the number of juveniles lost.

- A report shall be submitted to NMFS within 30 days of relocation activities indicating the number of listed species that were loss due to mortality and injury and the number of listed species that were relocated without harm. This report should be sent to:

  Central Valley Office
  National Marine Fisheries Service
  650 Capitol Mall, Suite 5-100
  Sacramento CA 95814
  FAX: (916) 930-3629
  Phone: (916) 930-3600

3. Measures shall be taken to maintain, monitor, and adaptively manage all conservation measures throughout the life of the project to ensure their effectiveness.

   - The FRA or HSRA on behalf of the FRA shall purchase riparian credits at a NMFS approved anadromous fish conservation bank at a 3:1 ratio for the aerial extent of riparian habitat affected by the action.

   - The FRA or HSRA on behalf of the FRA shall monitor and maintain all onsite riparian plantings within the action area for three years, and provide irrigation, fertilization, and replacement plantings as necessary to insure full and rapid recovery of disturbed riparian habitat features beneficial to anadromous fish.

   - If a listed species is observed injured or killed by project activities, FRA and/or HSRA shall contact Sierra Franks at NMFS within 48 hours at 916-930-3720 or 650 Capitol Mall, Suite 5-100, Sacramento, CA 95814. Notification shall include species identification, the number of fish, and a description of the action that resulted in take. If possible, dead individuals shall be collected, placed in an airtight bag, and refrigerated with the aforementioned information until further direction is received from NMFS.

   - Annual updates and reports required by these terms and conditions shall be submitted by December 31 of each year during the construction period to:

Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento CA 95814
FAX: (916) 930-3629
Phone: (916) 930-3600

XI. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The FRA and HSRA should advise their contractor to follow these water quality measures during construction of the proposed project.

- The contractor will implement all applicable Best Management Practices (BMPs) to avoid sedimentation, spills, etc.
- The contractor will be required to prepare a Storm Water Pollution Prevention Plan (SWPPP).
- During construction, all equipment refueling and maintenance shall occur more than 200 feet from the main channel, except for the pile driver(s) or other stationary equipment. Any spill within the floodplain and active channel of the San Joaquin River shall be reported to NMFS, CDFG and any other appropriate resource agencies within 48 hours.
- The contractor shall have an absorbent boom available within 250 feet of the live channel during all in or near channel work to be readily prepared for quick containment of any unanticipated spills within or adjacent to the San Joaquin River.
- All measures from the 1602 Streambed Alteration Agreement, 404 and 401 water quality certifications/permits will be adhered to.

2. Any riparian vegetation removal within 250 feet of the San Joaquin River, that cannot be restored onsite, must be mitigated offsite at a ratio of 3:1.

3. The FRA and HSRA should support and promote aquatic and riparian habitat restoration within the San Joaquin River Basin, and implement practices that avoid or minimize negative impacts to salmon and steelhead on all of their project sites.

In order for NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NOAA Fisheries requests notification of the implementation of any conservation recommendations.

XII. REINITIATION NOTICE

This concludes formal consultation on the High Speed Train, Merced to Fresno section. As provided in 50 CFR '402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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Enclosure 2

Magnuson-Stevens Fishery Conservation and Management Act

ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS

I. IDENTIFICATION OF ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended (U.S.C. 180 *et seq.*), requires that Essential Fish Habitat (EFH) be identified and described in Federal fishery management plans (FMPs). Federal action agencies must consult with NOAA's National Marine Fisheries Service (NMFS) on any activity which they fund, permit, or carry out that may adversely affect EFH. NMFS is required to provide EFH conservation and enhancement recommendations to the Federal action agencies.

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "water" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and, "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle. The proposed project site is within the region identified as EFH for Pacific salmon in Amendment 14 of the Pacific Salmon FMP.

An adverse effect is defined as any impact which reduces the quality and/or quantity of essential fish habitat. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of (EFH). Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. (50 CFR 600.810)

The Pacific Fishery Management Council (PFMC) has identified and described EFH, Adverse Impacts and Recommended Conservation Measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP (PFMC 1999). Freshwater EFH for Pacific salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem as described in Myers *et al.* (1998), and includes the San Joaquin-Lower Chowchilla hydraulic unit (18040001). Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), and Central Valley fall-/late fall-run Chinook salmon (*O. tshawytscha*) are species under the Salmon Plan that occur in the San Joaquin-Lower Chowchilla hydrologic unit.

Historical factors limiting salmon populations in the San Joaquin-Lower Chowchilla hydraulic unit include primarily the building of Friant Dam. Once Friant became completely operational the decision was made not to release any water for fish and wildlife purposes. Though approximately 52,000 acre feet were released for downstream riparian users the flow ceased after Gravelly Ford. This decision effectively dewatered some 62 miles of channel downstream of this point (Raines 1992). Despite the efforts by state and federal agency personnel to get salmon past the dry reaches, the lower beds were unreachable to the spawning salmon. The runs continued to return and die in the river until 1949. After that the San Joaquin Chinook was extirpated in its southernmost range. (sierrafoothill.org 2006)

In September 2006 an 18-year lawsuit to provide sufficient fish habitat in the San Joaquin River below Friant Dam near Fresno, California, by the U.S. Departments of the Interior and Commerce, the Natural Resources Defense Council (NRDC), and the Friant Water Users Authority (FWUA) reached a Settlement. The Settlement received Federal court approval in October 2006. (restoresjr.net 2011) In October 2009 flows were released from Friant, and have continued to do so continually since. By December 31, 2012, in accordance with the settlement CV spring-run Chinook salmon are to be reintroduced to this section of the San Joaquin River.

A. Life History and Habitat Requirements

1. Pacific Salmon

General life history information for Central Valley Chinook salmon is summarized below. Further detailed information on Chinook salmon Evolutionarily Significant Units (ESUs) are available in the NMFS status review of Chinook salmon from Washington, Idaho, Oregon, and California (Myers *et al.* 1998), and the NMFS proposed rule for listing several ESUs of Chinook salmon (63 FR 11482).

Adult Central Valley fall-run Chinook salmon enter the Sacramento and San Joaquin Rivers from July through December and spawn from October through December while adult Central Valley late fall-run Chinook salmon enter the Sacramento and San Joaquin Rivers from October to April and spawn from January to April (U.S. Fish and Wildlife Service [FWS] 1998). Chinook salmon spawning generally occurs in clean loose gravel in swift, relatively shallow riffles or along the edges of fast runs (NMFS 1997).

Egg incubation occurs from October through March (Reynolds *et al.* 1993). Shortly after emergence from their gravel nests, most fry disperse downstream towards the Delta and into the San Francisco Bay and its estuarine waters (Kjelson *et al.* 1982). The remaining fry hide in the gravel or station in calm, shallow waters with bank cover such as tree roots, logs, and submerged or overhead vegetation. These juveniles feed and grow from January through mid-May, and emigrate to the Delta and estuary from mid-March through mid-June (Lister and Genoe 1970). As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route, submerged and overhead cover in the form of rocks, aquatic and riparian vegetation, logs, and undercut banks provide habitat for food organisms, shade, and protect juveniles and smolts from predation. These smolts generally spend a very short time in the Delta and estuary before entry into the ocean.

II. PROPOSED ACTION

The proposed action is described in section II (Description of the Proposed Action) of the preceding biological and conference opinion for threatened California Central Valley steelhead (*Oncorhynchus mykiss*), and Central Valley spring-run Chinook salmon (*O. tshawytscha*) (Enclosure 1).

III. EFFECTS OF THE PROJECT ACTION

The effects of the proposed action on salmonid habitat (*i.e.*, for spring and fall/late fall-run Chinook salmon) are described at length in section V (Effects of the Action) of the preceding biological opinion, and generally are expected to apply to Pacific salmon EFH.

Effects to EFH stemming from construction activities that may contribute sediment and increase turbidity will be avoided or minimized by meeting Regional Water Quality Board objectives, implementing applicable BMPs, staging equipment outside of the riparian corridor, limiting the amount of riparian vegetation removal, and replacing lost riparian vegetation at the project site.

EFH will be adversely affected by the disturbance of up to 0.05 acres of riparian vegetation as a result of construction activities as well as the occupation of the riverbed and water column by temporary work trestles and the columns of the new bridge's substructure. The majority of these impacts are expected to be temporary, as all disturbed areas outside the actual footprint of the new bridge would be restored to preconstruction conditions and any areas of disturbed vegetation would be replanted with native riparian vegetation. Additionally, implementation of the proposed project would result in a permanent net increase of riverine habitat since this project would result in no piers being located within the wetted channel.

IV. CONCLUSION

Based on the best available information, and upon review of the effects of the proposed HST Merced to Fresno section, NMFS believes that the construction and operation of the project features may adversely affect EFH for Pacific salmon protected under MSA. However, the proposed action includes adequate measures (described in the preceding biological opinion and the EFH conservation recommendations below) to avoid, minimize, or otherwise offset the adverse effects to EFH.

V. EFH CONSERVATION RECOMMENDATIONS

As the habitat requirements of Central Valley fall-run Chinook salmon within the action area are similar to those of the federally listed species addressed in the attached biological opinion. NMFS recommends that the FRA or HSRA on behalf of the FRA purchase riparian credits at a NMFS approved anadromous fish conservation bank at a 3:1 ratio for the aerial extent of riparian habitat affected by the action and the FRA or HSRA on behalf of the FRA shall monitor and maintain all onsite riparian plantings within the action area for three years. and provide irrigation. fertilization. and replacement plantings as necessary to insure full and rapid recovery of disturbed riparian habitat features beneficial to anadromous

Those terms and conditions which require the submittal of reports and status updates can be disregarded for the purposes of this EFH consultation as there is no need to duplicate those submittals.

VI. STATUTORY REQUIREMENTS

Section 305 (b) 4(B) of the MSA requires that the Federal lead agency provide NMFS with a detailed written response within 30 days, and 10 days in advance of any action, to the EFH conservation recommendations, including a description of measures adopted by the lead agency for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR §600.920[j]). In the case of a response that is inconsistent with our recommendations, the lead agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreement with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

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APPENDIX C

Mitigation Monitoring and Enforcement Plan (MMEP)

CALIFORNIA HIGH-SPEED TRAIN

Mitigation Monitoring and Enforcement Plan

Merced to Fresno Section

September 2012

CALIFORNIA
High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

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Appendix A

A Project Design Features

1.0 Introduction

In February 2012, the Federal Railroad Administration (FRA) and California High-Speed Rail Authority (Authority) prepared a joint Final Project Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) for the Merced to Fresno Section of the California High-Speed Train (HST) Project (Project). The Final Project EIR/EIS satisfies the requirements of National Environmental Policy Act (NEPA) and is the basis for the FRA's Record of Decision (ROD). As part of the ROD, FRA has selected the north-south Hybrid Alternative and the Downtown Merced Station and Downtown Fresno Mariposa Street Station alternatives.

This Mitigation Monitoring and Enforcement Plan (MMEP) has been prepared for the Merced to Fresno Section of the HST Project and adheres to the Council on Environmental Quality's (CEQ) regulations (40 Code of Federal Regulations [CFR] Section 1505) and FRA Procedures for Considering Environmental Impacts (64 Federal Register 28545, May 26, 1999). Additionally, the FRA must adopt a monitoring and enforcement program where applicable for mitigation. On January 14, 2011, the CEQ finalized guidance entitled *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact* (CEQ Guidance). The CEQ Guidance is intended to assist federal agencies to develop mitigation programs that provide effective documentation, implementation, and monitoring of mitigation commitments and was considered in the preparation of this MMEP.

Table 1 of the MMEP describes mitigation measures that would avoid, minimize, or compensate for potential adverse environmental impacts to construct and operate the HST Project. These measures were developed by the FRA and the Authority in consultation with appropriate agencies, as well as with input from the public, to meet the requirements of NEPA and the California Environmental Quality Act (CEQA).

The Final EIR/EIS identified certain mitigation measures required to comply with CEQA. Since such measures might not otherwise be required under NEPA, they are described in this MMEP as "voluntary" (Table 2). These "voluntary" mitigation measures are included in FRA's MMEP to provide a comprehensive mitigation strategy for the HST Project. The Authority is required to comply with all mitigation measures adopted with the ROD, including those specific to CEQA and those addressing federal laws and requirements. As a result, the measures described as "voluntary" in this MMEP will be implemented by the Authority as mitigation measures necessary to comply with CEQA. The HST Project incorporates design features and best management practices (BMPs) identified in the Final Project EIR/EIS and described in detail in a series of technical reports that accompanied preparation of the environmental document. As a result of applying these design features and BMPs, the HST Project will avoid potential adverse environmental impacts in several resource areas, including electromagnetic interference/electromagnetic fields (EMI/EMF), hydrology and water resources, geology and soils, and hazardous materials and wastes. In addition, the regulatory requirements, including permitting and coordination with regulatory agencies, for many project-related activities provide additional assurance that potential adverse environmental impacts will not occur. Representative agencies include the U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), and Environmental Protection Agency[1] with jurisdiction under the Endangered Species Act and the Clean Water Act, respectively. Like the mitigation measures listed in Tables 1 and 2, the project design features (see Appendix A) and compliance with regulatory requirements are a condition of project approval and must be implemented by the Authority during design, construction, and operation of the Project.

The laws and orders the project is subject to and the design features that are part of the HST Project are described for the following resource areas in more detail in the corresponding chapters of the Final Project EIR/EIS:

- Transportation – Chapter 3.2, section 3.2.2, section 3.2.6

[1] EPA delegated authority under Section 401 of the Clean Water Act to the State of California.

- Air Quality and Global Climate Change – Chapter 3.3, section 3.3.2, section 3.3.8
- Noise and Vibration – Chapter 3.4, section 3.4.2, section 3.4.6
- Public Utilities and Energy – Chapter 3.6, section 3.6.2, section 3.6.6
- Biological Resources and Wetlands – Chapter 3.7, section 3.7.2, section 3.7.6
- Hydrology and Water Resources – Chapter 3.8, section 3.8.2, section 3.8.6
- Geology and Soils – Chapter 3.9, section 3.9.2, section 3.9.6
- Hazardous Materials and Wastes – Chapter 3.10, section 3.10.2, section 3.10.6
- Safety and Security – Chapter 3.11, section 3.11.2, section 3.11.6
- Socioeconomics, Communities, and Environmental Justice – Chapter 3.12, section 3.12.2, section 3.12.6
- Station Planning, Land Use, and Development –Chapter 3.13, section 3.13.2, section 3.13.16
- Agricultural Lands – Chapter 3.14, section 3.14.2, section 3.14.6
- Parks, Recreation, and Open Space, Chapter 3.15, section 3.15.2
- Aesthetics and Visual Resources – Chapter 3.16, section 3.16.2, section 3.16.6
- Cultural and Paleontological Resources – Chapter 3.17, section 3.17.2, section 3.17.6

2.0 Mitigation Monitoring and Enforcement Plan

The environmental effects of the Hybrid Alternative and station locations for the Merced to Fresno Section of the HST Project would result in effects that would be considered significant under NEPA. Mitigation measures that would reduce or eliminate potential adverse environmental effects are described in Chapter 3 of Volume 1 of the Final Project EIR/EIS. The specific provisions contained in the MMEP are presented as a table and include the mitigation measures identified in the Final Project EIR/EIS, organized by environmental issue and topical areas addressed in the EIR/EIS. In collaboration with FRA and the appropriate agencies, the Authority may refine the means by which it will implement a mitigation measure, as long as the alternative means ensure compliance during project implementation. The MMEP describes implementation and monitoring procedural guidance, responsibilities, and timing for each mitigation measure identified in the Final Project EIR/EIS, including:

- **Significant Impact:** Provides a brief description of the impact expected to occur from the proposed HST Project as identified in the Final Project EIR/EIS.
- **Mitigation Measure:** Provides the mitigation measure and monitoring requirements as identified the Final Project EIR/EIS.
- **Implementing Party/Monitoring/Reporting Party:** Identifies the entity that will be responsible for directly implementing the mitigation measures, monitoring, and reporting. Implementation can be the responsibility of the Authority or its Contractor. When project work is undertaken by the Authority's Contractor, the Contractor shall implement the mitigation measures that are pertinent to

their scope of work. The Contractor shall monitor construction activities to ensure that the mitigation measures are being properly implemented and accurately report their activity and results to the Authority. The Authority will periodically check the Contractor's activity, reports, and effectiveness of mitigation activities with oversight provided by the Authority during construction. Long-term mitigation monitoring responsibilities will be transferred from the Contractor to the Authority upon final contract acceptance. The following roles are described in the MMEP:

- **Authority**: A designated Authority representative will be responsible for implementing or monitoring and reporting mitigation measures as specified in this MMEP. As the state lead agency and proponent of this project, the Authority will implement the mitigation measures through its own actions, those of its contractors, and actions taken in cooperation with other agencies and entities. The Authority, in coordination with FRA, defines the mitigation measures required for the project. The Authority will periodically check the Contractor's activity, reports, and effectiveness of mitigation.
- **FRA**: CEQ regulations (40 CFR 1505.2(c)) and guidance allow federal agencies to monitor the implementation of environmental conditions and commitments established in an EIS. Consistent with this obligation, FRA will monitor the implementation of environmental commitments in the MMEP. In addition, implementation of these measures will be required as conditions of permits, licenses, and funding agreements. For example, the Authority is required to implement the mitigation strategy contained in this MMEP as a condition of the cooperative agreement between the FRA and the Authority.
- **Mitigation Manager**: The Contractor's representative will be responsible for overseeing HST Project mitigation to verify that mitigation is carried out as specified in the MMEP. When project work is undertaken by the Authority's Contractor, the Contractor shall implement the mitigation measures that are pertinent to their scope of work. The Contractor shall monitor construction activities to ensure that the mitigation measures are being properly implemented and accurately report their activity and results to the Authority. The Mitigation Manager will report the status of each mitigation measure to the Authority in accordance with the MMEP.
- **Project Biologist**: The Project Biologist will represent the construction management team, report directly to the construction management team, and be responsible for reporting and overseeing implementation of the biological resources mitigation measures.
- **Project Biological Monitor**: The Project Biological Monitor will be approved by and report directly to the Project Biologist. The Project Biological Monitor will be onsite during all ground-disturbing activities that have the potential to affect biological resources and will be the principal agent(s) in the direct implementation of the MMEP and compliance assurance.
- **Contractor's Biologist**: The Contractor's Biologist is responsible for implementing mitigation measures in compliance with the terms and conditions outlined in the MMEP and permits issued by the U.S. Fish and Wildlife (USFWS), U.S. Army Corps of Engineers (USACE), State Water Resource Control Board (SWRCB), and California Department of Fish and Game (CDFG).
- **Qualified Professional Archaeologist**: The Qualified Professional Archaeologist will be the Contractor's archaeologist and will meet the Secretary of the Interior's (SOI) Professional Qualifications Standards for Archaeology. The Contractor's Archaeologist shall be responsible for training Contractor's staff, implementing mitigation, and coordinating the status of the archaeological mitigation with the Authority in accordance with the MMEP.
- **Archaeological Monitor**: The Archaeological Monitor(s) will be members of Contractor's field crew responsible for field monitoring of archaeological mitigation in accordance with the MMEP. The Contractor shall determine how many Archaeological Monitors are needed to satisfy the mitigation requirements.

- **Post-Construction Contractor**: The Post-Construction Contractor will be hired by the Authority to perform post-construction activities associated with traffic monitoring and implementing defined additional measures if traffic congestion thresholds are met. **Mitigation Timing (Implementation Schedule/Reporting Schedule):** Not all mitigation actions will occur at the same time. Depending upon the measure, it may be undertaken prior to, during, or following project construction and initiation of operations. Measures may also be undertaken in conjunction with different construction packages or at such time as project operations reach a certain level. This column of the MMEP table identifies the stage of the project during which the mitigation action will be taken and when reporting is to occur, if reporting is required.

- **Implementation Mechanism or Tool:** Identifies the actions required to implement the measures, including any required agreements and/or conditions.

3.0 Environmental Management System (EMS)

The Authority will implement an Environmental Management System (EMS) consisting of strategic planning, policies and procedures, organizational structure, staffing and responsibilities, milestones, schedule, and resources devoted to achieving the Authority's environmental commitments. The EMS will also include a component that tracks the implementation of mitigation measures (as well as environmental commitments, BMPs, and design features) and can produce reports on compliance. FRA will receive periodic reports on compliance and may request additional reports as necessary to ensure that the MMEP is fully implemented. This system will rely on data provided by the design-build contractor, regional consultants, and others to produce status reports regarding construction status, permitting activities, monitoring, inspections, and other compliance activities.

Table 1
Mitigation Measures and Implementation Plan

Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Transportation								
TR #1: Permanent Road Closures.	**TR MM#1: Access Maintenance for Property Owners.** Maintain access for owners to property within the construction area to a level that maintains pre-project viability of the property for its pre-project use. If a proposed road closure restricts current access to a property, provide alternative access via connections to existing roadways. If adjacent road access is not available, prepare new road connections, if feasible. If alternative road access is not feasible, the property will be acquired.	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. The Contractor will meet with the applicable property owner to identify their preferred location for the new access on their property. **Monitoring/Reporting Party:** Mitigation Manager will verify noticing obligations are met.		X			Prepare advanced noticing prior to construction/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #2: Fresno Area between Herndon Avenue and Shaw Avenue Intersection Impacts –Existing Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation**. Add traffic signals to affected unsignalized intersections in order to improve LOS and intersection operation. • Cornelia Avenue/Shaw Avenue	**Implementing Party:** Authority. **Monitoring/Reporting Party:** Authority		X			Annual intersection LOS analysis. Installation of signal when warrant criteria are met.	Memorandum of Understanding with the City of Fresno
	TR MM#7: Widen Approaches to Intersections. Widen approaches in order to improve LOS and intersection operation. • Blythe Avenue/Shaw Avenue – eastbound approach	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#8: Add Exclusive Turn Lanes to Intersections. Add exclusive turn lanes at specific intersections in order to improve LOS and intersection operations. The traffic impacts associated at the identified intersections would be addressed by: • Signalizing the intersection at Cornelia Ave./Shaw Ave. and widening the approach at Blythe Avenue/Shaw Avenue to provide second left-turn lane	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #2: Fresno Area between Herndon Avenue and Shaw Avenue Intersection Impacts – Future (2035) Plus Project.	**TR MM#3: Modify Signal Phasing.** Modify traffic signal phasing sequence to improve operations at a signalized intersection. • Veterans Boulevard/Golden State Boulevard Connector – modify northbound and southbound right-turn as free movements	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	TR MM#4: Add Signal to Intersection to Improve LOS/Operation. This mitigation is only necessary when signal warrants are met, and such warrants for certain of the intersections requiring this mitigation are met after 2020, as described in the Final EIR/EIS. Such intersections shall be monitored on an annual basis and signal installed when warrants are met. • Golden State Boulevard/Santa Ana Avenue • Cornelia Avenue/Shaw Avenue • Cornelia Avenue/Golden State Boulevard	**Implementing Party:** Authority. **Monitoring/Reporting Party:** Authority.			X		Annual signal warrant analysis. Installation of signal when warrant criteria are met.	Memorandum of Understanding with the City of Fresno
	TR MM#5: Restripe Intersections. Restripe specific intersections surrounding proposed HST station locations in order to improve LOS and intersection operations. • Figarden Drive/Bullard Avenue – westbound approach to provide two left-turn lanes, one through lane and one right-turn lane • Veterans Boulevard/Bullard Avenue – eastbound approach to provide one left-turn lane and two right-turn lanes; northbound approach to provide three left-turn lanes and one through lane • Veterans Boulevard/Golden State Boulevard Connector – eastbound approach to provide one left-turn lane and four through lanes	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#6: Modify Signal Timing. Modify signal timing (to optimize cycle length and/or splits) at specific intersections surrounding proposed HST station locations in order to improve LOS and intersection operations. • Veterans Boulevard/Bullard Avenue • Veterans Boulevard/Golden State Boulevard Connector	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections. Widen approaches in order to improve LOS and intersection operation. • Golden State Boulevard/Santa Ana Avenue – northbound approach on Golden State Boulevard and widen downstream on Santa Ana Avenue • Cornelia Avenue/Shaw Avenue – westbound approach, northbound approach, and southbound approach; widen downstream on Cornelia Avenue • Blythe Avenue/Shaw Avenue – eastbound approach • Veterans Boulevard/Golden State Boulevard Connector – westbound approach	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#8: Add Exclusive Turn Lanes to Intersections. Add exclusive turn lanes at specific intersections in order to improve LOS and intersection operations. The traffic impacts associated at the identified intersections would be addressed as follows: • Golden State Boulevard/Santa Ana Avenue – northbound approach on Golden State Boulevard to provide dual left-turn lanes and one through lane; widen downstream on Santa Ana Avenue to two receiving lanes from one receiving lane • Cornelia Avenue/Shaw Avenue – restripe eastbound approach to provide one	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	left-turn lane, two through lanes, and one right-turn lane; westbound approach to provide two left-turn lanes, two through lanes, and one right-turn lane; northbound approach to provide one left-turn lane, one through lane, and one channelized right-turn; and southbound approach to provide one left-turn lane, one through lane, and one right-turn lane; downstream on Cornelia Avenue to two receiving lanes from one receiving lane • Blythe Avenue/Shaw Avenue – eastbound approach to provide a second left-turn lane • Veterans Boulevard/Golden State Boulevard Connector – westbound approach to provide additional left-turn lane and a through lane							
	TR-MM#9: Convert Two-Way- Stop to Four-Way Stop. Convert two-way stop controlled intersection to an all-way stop controlled intersection.	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	
	TR MM#10: Grade Separate Through Movements. Modify the intersection to provide an overpass for through movements to improve LOS and intersection operations. The traffic impacts associated at the identified intersections would be addressed by (per Final Project EIR/EIS Table 3.2-53): • Signalizing the intersection, widening the northbound approach to provide dual left-turn lanes and one through lane, and widening downstream of Santa Ana Avenue from one receiving lane to two receiving lanes to accommodate the dual left-turn lanes from northbound approach on Golden State Boulevard for the Golden State Boulevard/Santa Ana Avenue intersection • Signalizing the intersection, restriping eastbound approach to provide one left-turn lane, two through lanes, and one right-turn lane, widening westbound approach to provide two left-turn lanes, two through lanes and one right-turn lane, widening northbound approach to provide one left-turn lane, one through lane, and one channelized right-turn, widening southbound approach to provide one left-turn lane, one through lane, and one right-turn lane, and widening downstream on Cornelia Avenue form one receiving lane to two receiving lanes to accommodate the second left-tune lane from westbound approach on Shaw Avenue for the Cornelia Avenue/Shaw Avenue intersection • Widening eastbound approach to provide a second left-turn lane at Blythe Avenue/Shaw Avenue • Signalizing the intersection at Cornelia Avenue/Golden State Boulevard • restriping westbound approach to provide two left-turn lanes, one through lane and one right-turn lane for the Figarden Drive/Bullard Avenue intersection • Grade separating through movement on Veterans Boulevard, restriping eastbound approach to provide one left-turn lane and two right-turn lanes, restriping northbound approach to provide three left-turn lanes and one	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	through lane, and modifying the signal timing at the Veterans Boulevard/Bullard Avenue intersection • Restriping eastbound approach to provide one left-turn lane and four through lanes, widening westbound approach to provide additional left-turn lane and a through lane, and modify northbound and southbound right-turn as free movements at the Veterans Boulevard/Golden State Boulevard connector.							
TR #3: Fresno Area between Herndon Avenue and Shaw Avenue Roadway Impacts – Future (2035) Plus Project.	**TR MM#11: Add Lanes to the Segment.** Add travel lanes to the roadway segment in order to increase capacity and improve roadway operations. • Veterans Boulevard between Golden State Boulevard and Bullard Avenue – one lane in each direction	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #4: Fresno Area between McKinley Avenue and SR 180 Roadway Impacts – Future (2035) Plus Project.	**TR MM#11: Add Lanes to the Segment.** Add travel lanes to the roadway segment in order to increase capacity and improve roadway operations. The traffic impacts associated at the identified roadway segments would be addressed by (per Final Project EIR/EIS Table 3.2-55): • Adding one lane in each direction along West Olive Avenue between SR 99 ramps and North West Avenue • Adding one lane in each direction along West Belmont Avenue between North Arthur Avenue and SR 99 ramps	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #5: Fresno Area between McKinley Avenue and SR 180 Intersection Impacts – Existing Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation**. The traffic impacts associated at the identified roadway segments would be addressed by (per Final Project EIR/EIS Table 3.2-55): • Signalizing the intersection at the West Olive Avenue/SR 99 southbound ramps • Signalizing the intersection and providing at West Belmont Avenue/SR 99 southbound ramps a protected phasing for westbound left-turn movement • Signalizing the intersection at West Belmont Avenue/SR 99 northbound ramps	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #5: Fresno Area between McKinley Avenue and SR 180 Intersection Impacts – Future (2035) Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation**. Signalize and improve the following intersections as described above for TR MM#4: • West Olive Avenue/North West Avenue • West Belmont Avenue/ SR 99 southbound ramps • West Belmont Avenue/ SR 99 northbound ramps	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections. Widen approaches in order to improve LOS and intersection operation. • West Olive Avenue/SR 99 southbound ramps – southbound approach • West Olive Avenue/SR 99 northbound ramps – northbound approach	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#8: Add Exclusive Turn Lanes to Intersections.	**Implementing Party:** Contractor will prepare construction		X			Prepare construction	Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	The traffic impacts associated at the identified intersections would be addressed by (per Final Project EIR/EIS Table 3.2-55): • Widening the southbound approach to provide additional left-turn lane at West Olive Avenue/SR 99 southbound ramps • Widening the northbound approach to provide exclusive left-turn lane at West Olive Avenue/SR 99 northbound ramps • Signalizing the intersection at West Olive Avenue/North West Avenue • Signalizing the intersection at West Belmont Avenue/ SR 99 southbound ramps • Signalizing the intersection at West Belmont Avenue/ SR 99 northbound ramps	plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.					management plan/maintain weekly reporting schedule	Requirements/Specifications
TR #6: SR 99 Relocation Freeway Impacts – Future (2035) Plus Project.	**TR MM#2: Add Southbound Auxiliary Lane to SR 99.** Add southbound auxiliary lane south of the Clinton Avenue on-ramp to Olive Avenue.	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions and Caltrans. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #7: SR 99 Relocation Intersection Impacts – Existing Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation** Signalize and improve the following intersection as described above for TR MM#4: • Dakota Avenue/Brawley Avenue	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#5: Restripe Intersections. Restripe the following intersection as described above for TR MM#5: • Dakota Avenue/Brawley Avenue – northbound approach include exclusive left-turn lane and shared through-right-turn lane	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections. Widen the following intersections as described above for TR MM#7: • Clinton Avenue/Weber Avenue – southbound approach; eastbound approach • Dakota Avenue/Brawley Avenue – southbound approach	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#8: Add Exclusive Turn Lanes to Intersections. The traffic impacts associated at the identified intersections associated with the SR 99 realignment would be addressed by (per Final Project EIR/EIS Table 3.2-56): • Widening southbound approach to provide second left-turn lane and widening northbound approach to provide second left-turn lane for the Clinton Avenue/Weber Avenue intersection • Signalizing the intersection, restriping northbound approach to include exclusive left-turn lane and shared through-right-turn lane, and widening southbound approach to include exclusive left-turn, through, and exclusive right-turn lanes for the Dakota Avenue/Brawley Avenue intersection	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
TR #7: SR 99 Relocation Intersection Impacts – Future (2035) Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation** Signalize and improve the following intersections as described above for TR MM#4: • Shields Avenue/Brawley Avenue • Dakota Avenue/Brawley Avenue -	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#5: Restripe Intersections. Restripe the following intersections as described above for TR MM#5: • Clinton Avenue/Marks Avenue – southbound approach to include two left-turn lanes and one shared through-right-turn lane • Dakota Avenue/Brawley Avenue – northbound approach to include exclusive left-turn lane and shared through-right-turn lane; westbound approach to include exclusive left-turn lane and shared through-right-turn lane	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections. Widen approaches in order to improve LOS and intersection operation. • Clinton Avenue/Brawley Avenue – southbound approach • Clinton Avenue/Marks Avenue – southbound approach • Clinton Avenue/SR 99 southbound ramps – eastbound approach • Clinton Avenue/Weber Avenue – southbound approach; eastbound approach • Dakota Avenue/Brawley Avenue – southbound approach; eastbound approach • Ashlan Avenue - SR 99 southbound ramps/Parkway Drive – northbound approach	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#8: Add Exclusive Turn Lanes to Intersections. The traffic impacts associated at the identified intersections would be addressed by (per Final Project EIR/EIS Table 3.2-57): • Widening southbound approach to provide second left-turn lane at the Clinton Avenue/Brawley Avenue intersection • Widening northbound approach to provide exclusive northbound right-turn lane and restriping southbound approach to include two left-turn lanes and one shared through-right-turn lane at the Clinton Avenue/Marks Avenue intersection • Widening eastbound approach to provide exclusive eastbound right-turn lane at the Clinton Avenue/SR 99 southbound ramps intersection • Widening southbound approach to provide second left-turn lane and widening eastbound approach to provide second left-turn lane at the Clinton Avenue/Weber Avenue intersection • Signalizing the intersection at Shields Avenue/Brawley Avenue • Signalizing the intersection, restriping northbound approach to include exclusive left-turn lane and shared through-right-turn lane, restriping westbound approach to include exclusive left-turn lane and shared through-right-turn lane, widening southbound approach to include	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X			Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	exclusive left-turn, through, and exclusive right-turn lanes, and widening eastbound approach to include exclusive left-turn and shared through-right-turn lane at the Dakota Avenue/Brawley Avenue intersection • Adding second northbound right-turn lane at Ashland Avenue – SR 99 southbound ramps/Parkway Drive							
TR #8: HST Station Area Roadway Impacts – Existing Plus Project.	**TR MM#11: Add Lanes to the Segment.** Merced Station • M Street between 13th Street and 16th Street – adding one travel lane in each direction • V Street west of 13th Street (Option A only) - adding one travel lane in each direction Fresno Station • n/a	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.				X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
TR #8: HST Station Area Roadway Impacts – Future (2035) Plus Project.	**TR MM#11: Add Lanes to the Segment.** Merced Station • Main Street between Yosemite Parkway and G Street – add one travel lane in each direction • 16th Street between R Street and Martin Luther King Jr. Way – add one travel lane in each direction • V Street west of 13th Street to 16th Street (Option B only) – add one travel lane in each direction • M Street between 13st Street and 16th Street – add one travel lane in each direction • Martin Luther King Jr. Way between Childs Avenue and 13th Street – add one travel lane in each direction • S Street between 13th Street and 16th Street – add one travel lane in each direction Fresno Station • H Street between East Divisadero Street and Stanislaus Street – add one travel lane in each direction • Stanislaus Street between Broadway Street and E Street – add one travel lane in each direction • Fresno Street between Van Ness Avenue and Broadway Street (Tulare Street Overpass Option only) – add one travel lane in each direction • Fresno Street between G Street and SR 99 northbound ramps – add one travel lane in each direction • Tulare Street between Broadway Street and Van Ness Avenue (Tulare Street Underpass Option only) – add one travel lane in each direction • Divisadero Street between North Fresno Street and SR 41 ramps – add one travel lane in each direction • Van Ness Avenue between Ventura Avenue and SR 41 ramps (Tulare Street Overpass Option only) – add one travel lane in each direction • Stanislaus Street between E Street and F Street (Tulare Street Overpass Option only) – add one travel lane in each direction	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• F Street between Stanislaus Street and Tuolumne Street (Tulare Street Overpass Option only) – add one travel lane in each direction • Stanislaus Street between G Street and H Street (Tulare Street Overpass Option only) – add one travel lane in each direction • Stanislaus Street between Broadway Street and Fulton Street – add one travel lane in each direction • Stanislaus Street between L Street and M Street (Tulare Street Underpass Option only) – add one travel lane in each direction							
TR #9: HST Station Area Intersection Impacts – Existing Plus Project.	**TR MM#4: Add Signal to Intersection to Improve LOS/Operation.** Signalize and improve the following intersections as described above for TR MM#4: Merced Station • 16th/SR 59 • 13th Street/G Street • SR 99 northbound off-ramps/SR 140 Fresno Station • H Street/Ventura Street (Tulare Street Underpass Option Only) • Stanislaus Street/F Street • Stanislaus Street/N Street	**Implementing Party:** Contractor (post-construction contractor) **Monitoring/Reporting Party:** Authority will monitor and report intersection monitoring and signal construction			X	X	Contractor (post-construction contractor) will monitor intersection and then construct new signal based on warrant, in coordination with local jurisdictions. Authority will monitor signal construction and coordinate with local jurisdictions.	Memorandum of Understanding with the City of Fresno
	TR MM#5: Restripe Intersections. Restripe the following intersections as described above for TR MM#5: Merced Station • 16th Street/Canal Street – eastbound approach from one shared-through left lane and one exclusive right-turn lane to one exclusive left-turn lane and a shared through-right lane Fresno Station • SR 99 northbound ramps/Ventura Avenue – northbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane at the intersection	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Construction	Contract Requirements/Specifications
	TR MM#6: Modify Signal Timing. Modify signal timing at the following intersections as described above for TR MM#6: Merced Station • n/a Fresno Station • Divisadero Street/SR 41 northbound ramps/Tulare Street – re-time existing signal • H Street/Divisadero Street – re-time existing signal in AM • North Blackstone Avenue/SR 180 westbound ramps – re-time existing signal in AM	**Implementing Party:** Contractor in coordination with affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections.	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions.		X		X	Prepare construction management	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Widen approaches as described above for TR MM#7: Merced Station • 15th Street/M Street intersection (Option A only) – eastbound approach; westbound approach • 14th Street/Martin Luther King Jr. Way intersection – southbound approach Fresno Station • n/a	**Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.					plan/maintain weekly reporting schedule	
	TR MM#8: Add Exclusive Turn Lanes to Intersections. Merced Station The traffic impacts associated with the Merced Station at the identified roadway segments would be addressed by (per Table 3.2-59): • Adding one travel lane in each direction on Main Street between Yosemite Parkway and G Street • Adding one travel lane in each direction on 16th Street between R Street and Martin Luther King Jr. Way • Adding one travel lane in each direction on V Street west of 13th Street to 16th Street (Option B only) • Adding one travel lane in each direction on M Street between 13st Street and 16th Street • Adding one travel lane in each direction on Martin Luther King Jr. Way between Childs Avenue and 13th Street • Adding one travel lane in each direction on S Street between 13th Street and 16th Street Fresno Station The traffic impacts associated with the Fresno Station at the identified roadway segments would be addressed by (per Final Project EIR/EIS Table 3.2-60): • Adding one travel lane in each direction on H Street between East Divisadero Street and Stanislaus Street • Adding one travel lane in each direction on Stanislaus Street between Broadway Street and E Street • Adding one travel lane in each direction on Fresno Street between Van Ness Avenue and Broadway Street (Tulare Street Underpass Option only) • Adding one travel lane in each direction on Fresno Street between G Street and SR 99 northbound ramps • Adding one travel lane in each direction on Tulare Street between Broadway Street and Van Ness Avenue (Tulare Street Underpass Option only) • Adding one travel lane in each direction on Divisadero Street between North Fresno Street and SR 41 ramps • Adding one travel lane in each direction on Van Ness Avenue between Ventura Avenue and SR 41 ramps (Tulare Street Overpass Option only)	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• Adding one travel lane in each direction on Stanislaus Street between E Street and F Street (Tulare Street Overpass Option only) • Adding one travel lane in each direction on F Street between Stanislaus Street and Tuolumne Street (Tulare Street Overpass Option only) • Adding one travel lane in each direction on Stanislaus Street between G Street and H Street (Tulare Street Overpass Option only) • Adding one travel lane in each direction on Stanislaus Street between Broadway Street and Fulton Street • Adding one travel lane in each direction on Stanislaus Street between L Street and M Street (Tulare Street Underpass Option only)							
	TR MM#9: Convert Two-Way Stop to Four-Way Stop. Convert two-way stop controlled intersection to an all-way stop controlled intersection. • Signalizing the intersection, widening northbound approach to add second right-turn lane, widening westbound approach to add second left-turn lane, providing signal phasing to “overlap” northbound right-turn movement with westbound left-turn movement and westbound right-turn with southbound left-turn movement at 16th Street/SR 59 • Restriping the southbound approach from left-turn, through, shared through-right-turn lane to left-turn lane, and shared through-right-turn lane and widening SR 99 southbound off-ramp to add exclusive right-turn lane at 13th Street – SR 99 southbound off-ramp/V Street • Modifying the signal timing at 16th Street/V Street • Signalizing the intersection at 15th Street/M Street (meets signal warrant between 2020 and 2025) • Widening the southbound approach on Childs Avenue to provide exclusive right-turn lane at Childs Avenue/Martin Luther King Jr. Way • Signalizing the intersection at SR 99 southbound ramps/Martin Luther King Jr. Way • Signalizing the intersection at SR 99 northbound ramps/Martin Luther King Jr. Way • Signalizing the intersection at 14th Street/Martin Luther King Jr. Way • Signalizing the intersection, restriping northbound approach from single lane to shared left-through and right-turn lane, widening eastbound approach to provide a second through lane, and restriping westbound approach from an exclusive right-turn lane to a shared through-right-turn lane at 13th Street/G Street • Signalizing the intersection at SR 99 southbound off-ramp/14st Street/G Street • Signalizing the intersection, restriping eastbound approach to provide a second through lane, and widening westbound approach to add a second through lane at SR 99 northbound off-ramp/Yosemite Parkway • Restriping southbound approach to provide exclusive right-turn lane and restriping eastbound approach from exclusive right-turn lane to a shared though-right-turn lane at Motel Drive/Glen Avenue/Yosemite Parkway • Converting two-way stop controlled intersection to an all-way stop	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.	X				Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	controlled intersection at 14th Street/O Street (Option A only) • Signalizing the intersection at 13th Street/M Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 14th Street/M Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 15th Street/Canal Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 11th Street/Martin Luther King Jr. Way (meets signal warrant between 2020 and 2025) • Signalizing the intersection at Main Street/H Street (meets signal warrant between 2020 and 2025) • Optimizing cycle length at Main Street/G Street The traffic impacts associated with the Fresno Station at the identified intersections would be addressed by: • Restriping the eastbound approach to provide one exclusive left-turn lane and on shared left/through/right-turn lane at the intersection of Van Ness Avenue/SR 41 northbound ramp • Signalizing the intersection at SR 99 northbound ramps/Ventura Avenue • Signalizing the intersection at Broadway Avenue/Ventura Avenue • Widening the northbound approach to add one exclusive right-turn, one left-turn lane, and one through lane and modifying the signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Broadway Avenue/Ventura Avenue (Tulare Street Underpass Option) • Widening the eastbound approach to add two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane and modifying the signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Broadway Avenue/Ventura Avenue (Tulare Street Overpass Option) • Modifying the existing traffic signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Van Ness Avenue/Ventura Street intersection • Widening the east bound approach to provide one exclusive left-turn lane and one exclusive right-turn lane at the intersection at H Street/Kern Street (Tulare Street Underpass Option only) • Widening the southbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, one through lane, and one exclusive right-turn lane; and modifying the signal phasing to provide protected left-turn phases for the eastbound and westbound approaches for E Street/Tulare Street intersection (Tulare Street Overpass Option only) • Widening the northbound approach to provide one exclusive left-turn, and one shared through/right-turn lane; widening the southbound approaches to provide one exclusive left-turn lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and one through lane; and modifying the							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	signal phasing to provide protected left-turn phases for all approaches for F Street/Tulare Street (Tulare Street Underpass Option only) • Widening westbound approach to provide one exclusive right-turn lane, on exclusive left-turn lane, and two through lanes; widening northbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes; and widening southbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes for H Street/Tulare Street (Tulare Street Underpass Option only) • Widening the westbound approach to provide one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane at the intersection of Van Ness Avenue/Tulare Street (Tulare Street Underpass Option only) • Modifying the existing traffic signal phasing to provide protected left0turn phases for the eastbound and westbound approaches at U Street/Tulare Street • Widening the eastbound approach to provide two exclusive through lanes and one exclusive through lanes and one exclusive right-turn lane at the intersection of SR 99 southbound ramps/Fresno Street • Restriping the eastbound approach to provide two exclusive left-turn lanes and one exclusive through lane at SR 99 northbound ramps/Fresno Street (Tulare Street Underpass Option) • Restriping the westbound approach to provide one through lane, one shared through/right-turn lane, and one exclusive right-turn lane at SR 99 northbound ramps/Fresno Street (Tulare Street Overpass Option) • Widening the southbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one exclusive right turn lane at the intersection of Van Ness Avenue/Fresno Street (Tulare Street Underpass Option) • Widening the northbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane and widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at the intersection of Van Ness Avenue/Fresno Street (Tulare Street Overpass Option) • Modifying the existing traffic signal to provide split phases for the eastbound and westbound approaches at the intersection of Fresno Street/Divisadero Street • Widening eastbound approach to provide one exclusive left-turn lane, one through lane and one exclusive right-turn lane at Van Ness Avenue/Tuolumne Street • Restriping the westbound approach to provide one shared left/though lane, one through lane, and one shared through/right-turn lane; restriping the southbound approach to provide one shared left/through lane and one exclusive right-turn lane; and modifying signal phasing to provide split phasing on eastbound and westbound approaches at E Street/Stanislaus Street (Tulare Street Overpass Option only) • Restriping the southbound approach to provide shared left/through lane							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	and one exclusive right-turn lane and modifying the signal phasing to provide permissive phase on northbound and southbound approaches at Broadway Street/Stanislaus Street (Tulare Street Overpass Option only) • Widening westbound approach to provide one exclusive left turn lane, one through lane and one shared through/right-turn lane at Van Ness Avenue/Stanislaus Street (Tulare street Underpass Option only) • Signalizing the intersection at H Street/San Joaquin Street • Signalizing the intersection and widening southbound approach to provide on exclusive left-turn lane and one through lane at H Street/Amador Street • Restriping the westbound approach to provide one shared through/right/left-turn lane and two exclusive right-turn lanes; widening the northbound approach to provide two exclusive left-turn lanes and one shared through/right-turn lane; and widening the southbound approach to provide additional left turn lane (on H Street) at H Street/Divisadero Street • Widening the eastbound approaches to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane and widening the westbound approach to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane at the intersection of Van Ness Avenue/Divisadero Street • Widening the westbound approach (S Street) to provide one shared through/right-turn lane, one exclusive through lane, and one exclusive left0turn lane at H Street/Roosevelt Street • Widening the westbound approach to provide one exclusive left turn lane and one exclusive through lane at North Blackstone Avenue/East McKenzie Avenue • Restriping the northbound approach to provide one exclusive through lane, one shared through/right0turn lane, and one exclusive right-turn lane at the intersection of Van Ness Avenue/SR 180 eastbound ramps • Widening the eastbound approach to provide one additional exclusive left-turn lane at the intersection of Van Ness Avenue/SR 180 westbound ramps • Widening the southbound approach to provide one exclusive left-turn lane, two exclusive through lanes, and one shared through/right-turn lane at the intersection of North Blackstone Avenue/East Belmont Avenue • Restriping the northbound approach to provide one shared left/through lane, one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane at the intersection of North Abby Street/SR 180 eastbound ramps • Widening the eastbound approach to provide one additional exclusive right-turn lane at the intersection of North Blackstone Avenue/SR 180 westbound ramps • Signalizing the intersection at Broadway Street/Amador Street • Restriping the northbound approach to provide one exclusive left-turn lane, on exclusive through lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, two through lanes and one exclusive right-turn lane; and widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at Fresno Street/F Street							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	(Tulare Street Underpass Option) • Restriping the northbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, one through lane, one shared through/right-turn lane, and one exclusive right-turn lane; widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at Fresno Street/F Street (Tulare Street Overpass Option) • Signalizing the intersection at H Street/Ventura Street (Tulare Street Underpass Option only) • Signalizing the intersection at G Street/Mono Street (Tulare Street Underpass Option only) • Signalizing the intersection; widening northbound approach to provide exclusive left-turn lane; widening southbound approach to provide exclusive left-turn lane; and modifying signal phasing on northbound and southbound approaches to provide protected plus permissive left-turn phasing at the intersection of South Van Ness Avenue/East California Street • Providing an exclusive right-turn lane in the northbound direction and modifying signal phasing on all approaches to provide protected plus permissive left turn phase at Golden State Boulevard/East Church Avenue • Increasing the cycle length (in the PM Peak Hour only) at South East Avenue/Golden State Boulevard • Providing an exclusive right-turn lane for both northbound and southbound approaches at Golden State Boulevard/East Jensen Avenue • Widening the northbound approach to provide one exclusive left-turn lane and two exclusive right-turn lanes at Stanislaus Street/F Street (Tulare Street Overpass Option only) • Restriping the eastbound approach to provide one exclusive left-turn lane, one shared left/through lane and one exclusive right0turn lane at Tuolumne Street/F Street (Tulare Street Overpass Option only) • Widening the northbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane at Stanislaus Street/L Street • Widening the southbound approach to provide one shared left/through lane and one exclusive right-turn lane at Stanislaus Street/M Street • Widening the westbound approach to provide one exclusive left-turn lane, one through lane and one shared through/right-turn lane at Stanislaus Street/N Street							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
TR #9: HST Station Area Intersection Impacts – Future (2035) Plus Project.	**TR MM#3: Modify Signal Phasing.** Modify signal phasing as described in TR MM#3 above: Merced Station • 16th Street/Martin Luther King Jr. Way – change northbound/southbound split phasing to protected phasing Fresno Station • Broadway Avenue/Ventura Avenue - provide protected left turn phases for the northbound and southbound approaches • Van Ness Avenue/Ventura Street - provide protected left-turn phases for the northbound and southbound approaches • E Street/Tulare Street (Tulare Street Overpass Option only) – provide protected left-turn phases for the eastbound and westbound approaches • F Street/Tulare Street (Tulare Street Underpass Option only) – provide protected left-turn phases for all approaches • H Street/Tulare Street (Tulare Street Underpass Option only) – provide protected left-turn phases for all approaches • U Street/Tulare Street – provide protected left-turn phases for the eastbound and westbound approaches • Fresno Street/Divisadero Street – provide split phases for the eastbound and westbound approaches • E Street/Stanislaus Street (Tulare Street Overpass Option only) – provide split phasing on eastbound and westbound approaches • Broadway Street/Stanislaus Street (Tulare Street Overpass Option only) – provide permissive phase on northbound and southbound approaches • South Van Ness Avenue/East California Avenue – provide protected plus permissive left-turn phasing for northbound and southbound approaches • Golden State Boulevard/East Church Avenue – provide protected plus permissive left-turn phase on all approaches	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#4: Add Signal to Intersection to Improve LOS/Operation. Add signals as described in TR MM#4 above: Merced Station • 16th Street/SR 59 – providing signal phasing to "overlap" northbound right-turn movement with westbound left-turn movement and westbound right-turn with southbound left-turn movement • 15th Street/M Street – meets signal warrant between 2020 and 2025 • SR 99 southbound ramps/Martin Luther King Jr. Way • SR 99 northbound ramps/Martin Luther King Jr. Way • 14th Street/Martin Luther King Jr. Way • 13th Street/G Street • SR 99 southbound off-ramp/14st Street/G Street • SR 99 northbound off-ramp/Yosemite Parkway • 13th Street/M Street – meets signal warrant between 2020 and 2025 • 14th Street/M Street – meets signal warrant between 2020 and 2025	**Implementing Party:** Contractor (post-construction contractor) **Monitoring/Reporting Party:** Authority will monitor and report intersection monitoring and signal construction			X	X	Contractor (post-construction contractor) will monitor intersection and then construct new signal based on warrant, in coordination with local jurisdictions. Weekly/monthly reporting as needed to document completion of improvements.	Intersections will have to be monitored once a year to determine if/when the warrant is met.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• 15th Street/Canal Street – meets signal warrant between 2020 and 2025 • 11th Street/Martin Luther King Jr. Way – meets signal warrant between 2020 and 2025 • Main Street/H Street – meets signal warrant between 2020 and 2025 Fresno Station • SR 99 northbound ramps/Ventura Avenue • E Street/Ventura Avenue • H Street/San Joaquin Street • H Street/Amador Street • Broadway Street/Amador Street • H Street/Ventura Street (Tulare Street Underpass Option only) • G Street/Mono Street (Tulare Street Underpass Option only) • South Van Ness Avenue/East California Street							
	TR MM#5: Restripe Intersections. Restripe intersections as described in TR MM#5 above: Merced Station • 13th Street - SR 99 southbound off-ramp/V Street – southbound approach from left-turn, through, shared through-right-turn lane to left-turn lane, and shared through-right-turn lane • 13th Street/G Street – northbound approach from single lane to shared left-through and right-turn lane; westbound approach from an exclusive right-turn lane to a shared through-right-turn lane • SR 99 northbound off-ramp/Yosemite Parkway – eastbound approach to provide a second through lane • Motel Drive/Glen Avenue/Yosemite Parkway – southbound approach to provide exclusive right-turn lane and restriping eastbound approach from exclusive right-turn lane to a shared though-right-turn lane; eastbound approach from exclusive right-turn lane to a shared though-right-turn lane Fresno Station • Van Ness Avenue/SR 41 northbound ramp – eastbound approach to provide one exclusive left-turn lane and on shared left/through/right-turn lane • SR 99 northbound ramps/Fresno Street (Tulare Street Underpass Option) – eastbound approach to provide two exclusive left-turn lanes and one exclusive through lane • SR 99 northbound ramps/Fresno Street (Tulare Street Overpass Option) – westbound approach to provide one through lane, one shared through/right-turn lane, and one exclusive right-turn lane • E Street/Stanislaus Street (Tulare Street Overpass Option only) – westbound approach to provide one shared left/though lane, one through lane, and one shared through/right-turn lane; southbound approach to provide one shared left/through lane and one exclusive right-turn lane • Broadway Street/Stanislaus Street (Tulare Street Overpass Option only) –	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	southbound approach to provide shared left/through lane and on exclusive right-turn lane • H Street/Divisadero Street – westbound approach to provide one shared through/right/left-turn lane and two exclusive right-turn lanes • Van Ness Avenue/SR 180 eastbound ramps – northbound approach to provide one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane • North Abby Street/SR 180 eastbound ramps – northbound approach to provide one shared left/through lane, one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane • Fresno Street/F Street (Tulare Street Underpass Option) – northbound approach to provide one exclusive left-turn lane, on exclusive through lane, and one shared through/right-turn lane • Fresno Street/F Street (Tulare Street Overpass Option) – northbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one shared through/right-turn lane • Tuolumne Street/F Street (Tulare Street Overpass Option only) – eastbound approach to provide one exclusive left-turn lane, one shared left/through lane and one exclusive right-turn lane							
	TR MM#6: Modify Signal Timing. Modify signal timing as described in TR MM#6 above: <u>Merced Station</u> • 16th Street/V Street • Main Street/G Street - optimizing cycle length <u>Fresno Station</u> • South East Avenue/Golden State Boulevard - increasing the cycle length (in the PM Peak Hour only)	**Implementing Party:** Contractor in coordination with affected jurisdiction. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
	TR MM#7: Widen Approaches to Intersections. Widen approaches as described in TR MM#7 above: <u>Merced Station</u> • 16th Street/SR 59 – northbound approach; westbound approach • 13th Street – SR 99 southbound off-ramp/V Street – SR 99 southbound off-ramp • Childs Avenue/Martin Luther King Jr. Way – southbound approach • 13th Street/G Street – eastbound approach • SR 99 northbound off-ramp/Yosemite Parkway – westbound approach <u>Fresno Station</u> • Broadway Avenue/Ventura Avenue (Tulare Street Underpass Option) - northbound approach • Broadway Avenue/Ventura Avenue (Tulare Street Overpass Option) - eastbound approach • H Street/Kern Street (Tulare Street Underpass Option only) – eastbound	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	approach • E Street/Tulare Street intersection (Tulare Street Overpass Option only) – southbound approach; westbound approach • F Street/Tulare Street (Tulare Street Underpass Option only) – northbound approach; southbound approach; westbound approach • H Street/Tulare Street (Tulare Street Underpass Option only) – westbound approach; northbound approach; southbound approach • Van Ness Avenue/Tulare Street (Tulare Street Underpass Option only) – westbound approach • SR 99 southbound ramps/Fresno Street – eastbound approach • Van Ness Avenue/Fresno Street (Tulare Street Underpass Option) – southbound approach • Van Ness Avenue/Fresno Street (Tulare Street Overpass Option) – northbound approach; eastbound approach • Van Ness Avenue/Tuolumne Street –eastbound approach • Van Ness Avenue/Stanislaus Street (Tulare Street Underpass Option only) – westbound approach • H Street/Amador Street – southbound approach • H Street/Divisadero Street –northbound approach; southbound approach • Van Ness Avenue/Divisadero Street – eastbound approaches; westbound approach • H Street/Roosevelt Street – westbound approach (H Street) • North Blackstone Avenue/East McKenzie Avenue – westbound approach • Van Ness Avenue/SR 180 westbound ramps – eastbound approach • North Blackstone Avenue/East Belmont Avenue – southbound approach • North Blackstone Avenue/SR 180 westbound ramps – eastbound approach • Fresno Street/F Street (Tulare Street Underpass Option) – westbound approach; eastbound approach • Fresno Street/F Street (Tulare Street Overpass Option) –westbound approach; eastbound approach • South Van Ness Avenue/East California Street – northbound approach; southbound approach • Stanislaus Street/F Street (Tulare Street Overpass Option only) – northbound approach • Stanislaus Street/L Street – northbound approach • Stanislaus Street/M Street – southbound approach • Stanislaus Street/N Street – westbound approach							
	TR MM#8: Add Exclusive Turn Lanes to Intersections. Add turn lanes as described in TR MM#8 above: <u>Merced Station</u> • 16th Street/SR 59 - northbound approach to add second right-turn lane; westbound approach to add second left-turn lane • 13th Street – SR 99 southbound off-ramp/V Street – SR 99 southbound	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.		X		X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	off-ramp to add exclusive right-turn lane • Childs Avenue/Martin Luther King Jr. Way – southbound approach on Childs Avenue to provide exclusive right-turn lane • 13th Street/G Street – northbound approach from single lane to shared left-through and right-turn lane; westbound approach from an exclusive right-turn lane to a shared through-right-turn lane; eastbound approach to provide a second through lane • Motel Drive/Glen Avenue/Yosemite Parkway – southbound approach to provide exclusive right-turn lane and restriping eastbound approach from exclusive right-turn lane to a shared though-right-turn lane; eastbound approach from exclusive right-turn lane to a shared though-right-turn lane Fresno Station • Van Ness Avenue/SR 41 northbound ramp – eastbound approach to provide one exclusive left-turn lane and on shared left/through/right-turn lane • Broadway Avenue/Ventura Avenue (Tulare Street Underpass Option) – northbound approach to add one exclusive right-turn, one left-turn lane, and one through lane • Broadway Avenue/Ventura Avenue (Tulare Street Overpass Option) – eastbound approach to add two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane; provide protected left-turn phases for the northbound and southbound approaches • H Street/Kern Street (Tulare Street Underpass Option only) – eastbound approach to provide one exclusive left-turn lane and one exclusive right-turn lane • E Street/Tulare Street intersection (Tulare Street Overpass Option only) – southbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane; westbound approach to provide one exclusive left-turn lane, one through lane, and one exclusive right-turn lane • F Street/Tulare Street (Tulare Street Underpass Option only) – northbound approach to provide one exclusive left-turn and one shared through/right-turn lane; southbound approaches to provide one exclusive left-turn lane and one shared through/right-turn lane; westbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and one through lane • H Street/Tulare Street (Tulare Street Underpass Option only) –westbound approach to provide one exclusive right-turn lane, on exclusive left-turn lane, and two through lanes; northbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes; and southbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes • Van Ness Avenue/Tulare Street (Tulare Street Underpass Option only) – westbound approach to provide one exclusive left-turn lane, two through							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	lanes, and one exclusive right-turn lane • SR 99 southbound ramps/Fresno Street – eastbound approach to provide two exclusive through lanes and one exclusive through lanes and one exclusive right-turn lane • SR 99 northbound ramps/Fresno Street (Tulare Street Underpass Option) – eastbound approach to provide two exclusive left-turn lanes and one exclusive through lane • SR 99 northbound ramps/Fresno Street (Tulare Street Overpass Option) – westbound approach to provide one through lane, one shared through/right-turn lane, and one exclusive right-turn lane • Van Ness Avenue/Fresno Street (Tulare Street Underpass Option) – southbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one exclusive right turn lane • Van Ness Avenue/Fresno Street (Tulare Street Overpass Option) – northbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane; eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane • Van Ness Avenue/Tuolumne Street –eastbound approach to provide one exclusive left-turn lane, one through lane and one exclusive right-turn lane • E Street/Stanislaus Street (Tulare Street Overpass Option only) – westbound approach to provide one shared left/though lane, one through lane, and one shared through/right-turn lane; southbound approach to provide one shared left/through lane and one exclusive right-turn lane • Broadway Street/Stanislaus Street (Tulare Street Overpass Option only) – southbound approach to provide shared left/through lane and on exclusive right-turn lane • Van Ness Avenue/Stanislaus Street (Tulare Street Underpass Option only) – westbound approach to provide one exclusive left-turn lane, one through lane and one shared through/right-turn lane • H Street/Amador Street – southbound approach to provide on exclusive left-turn lane and one through lane • H Street/Divisadero Street –northbound approach to provide two exclusive left-turn lanes and one shared through/right-turn lane; southbound approach to provide additional left-turn lane (on H Street) • Van Ness Avenue/Divisadero Street – eastbound approaches to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane; westbound approach to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane • H Street/Roosevelt Street – westbound approach (H Street) to provide one shared through/right-turn lane, one exclusive through lane, and one exclusive left-turn lane • North Blackstone Avenue/East McKenzie Avenue – westbound approach to provide one exclusive left0turn lane and one exclusive through lane • Van Ness Avenue/SR 180 eastbound ramps – northbound approach to							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	provide one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane • Van Ness Avenue/SR 180 westbound ramps – eastbound approach to provide one additional exclusive left-turn lane • North Blackstone Avenue/East Belmont Avenue – southbound approach to provide one exclusive left-turn lane, two exclusive through lanes, and one shared through/right-turn lane • North Abby Street/SR 180 eastbound ramps – northbound approach to provide one shared left/through lane, one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane • North Blackstone Avenue/SR 180 westbound ramps – eastbound approach to provide one additional exclusive right-turn lane • Fresno Street/F Street (Tulare Street Underpass Option) – northbound approach to provide one exclusive left-turn lane, on exclusive through lane, and one shared through/right-turn lane; westbound approach to provide one exclusive left-turn lane, two through lanes and one exclusive right-turn lane; and eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane • Fresno Street/F Street (Tulare Street Overpass Option) – northbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one shared through/right-turn lane; westbound approach to provide one exclusive left-turn lane, one through lane, one shared through/right-turn lane, and one exclusive right-turn lane; eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane • South Van Ness Avenue/East California Street – northbound approach to provide exclusive left-turn lane; southbound approach to provide exclusive left-turn lane • Golden State Boulevard/East Church Avenue – exclusive right-turn lane in the northbound direction • Golden State Boulevard/East Jensen Avenue – exclusive right-turn lane for both northbound and southbound approaches • Stanislaus Street/F Street (Tulare Street Overpass Option only) – northbound approach to provide one exclusive left-turn lane and two exclusive right-turn lanes • Tuolumne Street/F Street (Tulare Street Overpass Option only) – eastbound approach to provide one exclusive left-turn lane, one shared left/through lane and one exclusive right-turn lane • Stanislaus Street/L Street – northbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane • Stanislaus Street/M Street – southbound approach to provide one shared left/through lane and one exclusive right-turn lane • Stanislaus Street/N Street – westbound approach to provide one exclusive left-turn lane, one through lane and one shared through/right-turn lane							
	TR MM#9: Convert Two-Way Stop to Four-Way Stop. Convert two-way stop controlled intersection to an all-way stop controlled intersection.	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions.	X				Prepare construction management	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• Signalizing the intersection, widening northbound approach to add second right-turn lane, widening westbound approach to add second left-turn lane, providing signal phasing to "overlap" northbound right-turn movement with westbound left-turn movement and westbound right-turn with southbound left-turn movement at 16th Street/SR 59 • Restriping the southbound approach from left-turn, through, shared through-right-turn lane to left-turn lane, and shared through-right-turn lane and widening SR 99 southbound off-ramp to add exclusive right-turn lane at 13th Street – SR 99 southbound off-ramp/V Street • Modifying the signal timing at 16th Street/V Street • Signalizing the intersection at 15th Street/M Street (meets signal warrant between 2020 and 2025) • Widening the southbound approach on Childs Avenue to provide exclusive right-turn lane at Childs Avenue/Martin Luther King Jr. Way • Signalizing the intersection at SR 99 southbound ramps/Martin Luther King Jr. Way • Signalizing the intersection at SR 99 northbound ramps/Martin Luther King Jr. Way • Signalizing the intersection at 14th Street/Martin Luther King Jr. Way • Signalizing the intersection, restriping northbound approach from single lane to shared left-through and right-turn lane, widening eastbound approach to provide a second through lane, and restriping westbound approach from an exclusive right-turn lane to a shared through-right-turn lane at 13th Street/G Street • Signalizing the intersection at SR 99 southbound off-ramp/14st Street/G Street • Signalizing the intersection, restriping eastbound approach to provide a second through lane, and widening westbound approach to add a second through lane at SR 99 northbound off-ramp/Yosemite Parkway • Restriping southbound approach to provide exclusive right-turn lane and restriping eastbound approach from exclusive right-turn lane to a shared though-right-turn lane at Motel Drive/Glen Avenue/Yosemite Parkway • Converting two-way stop controlled intersection to an all-way stop controlled intersection at 14th Street/O Street (Option A only) • Signalizing the intersection at 13th Street/M Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 14th Street/M Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 15th Street/Canal Street (meets signal warrant between 2020 and 2025) • Signalizing the intersection at 11th Street/Martin Luther King Jr. Way (meets signal warrant between 2020 and 2025) • Signalizing the intersection at Main Street/H Street (meets signal warrant between 2020 and 2025) • Optimizing cycle length at Main Street/G Street The traffic impacts associated with the Fresno Station at the identified	**Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.					plan/maintain weekly reporting schedule	

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	intersections would be addressed by: • Restriping the eastbound approach to provide one exclusive left-turn lane and on shared left/through/right-turn lane at the intersection of Van Ness Avenue/SR 41 northbound ramp • Signalizing the intersection at SR 99 northbound ramps/Ventura Avenue • Signalizing the intersection at Broadway Avenue/Ventura Avenue • Widening the northbound approach to add one exclusive right-turn, one left-turn lane, and one through lane and modifying the signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Broadway Avenue/Ventura Avenue (Tulare Street Underpass Option) • Widening the eastbound approach to add two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane and modifying the signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Broadway Avenue/Ventura Avenue (Tulare Street Overpass Option) • Modifying the existing traffic signal phasing to provide protected left-turn phases for the northbound and southbound approaches for Van Ness Avenue/Ventura Street intersection • Widening the east bound approach to provide one exclusive left-turn lane and one exclusive right-turn lane at the intersection at H Street/Kern Street (Tulare Street Underpass Option only) • Widening the southbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, one through lane, and one exclusive right-turn lane; and modifying the signal phasing to provide protected left-turn phases for the eastbound and westbound approaches for E Street/Tulare Street intersection (Tulare Street Overpass Option only) • Widening the northbound approach to provide one exclusive left-turn, and one shared through/right-turn lane; widening the southbound approaches to provide one exclusive left-turn lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and one through lane; and modifying the signal phasing to provide protected left-turn phases for all approaches for F Street/Tulare Street (Tulare Street Underpass Option only) • Widening westbound approach to provide one exclusive right-turn lane, on exclusive left-turn lane, and two through lanes; widening northbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes; and widening southbound approach to provide one exclusive right-turn lane, one exclusive left-turn lane, and two through lanes for H Street/Tulare Street (Tulare Street Underpass Option only) • Widening the westbound approach to provide one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane at the intersection of Van Ness Avenue/Tulare Street (Tulare Street Underpass Option only) • Modifying the existing traffic signal phasing to provide protected left0turn							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	phases for the eastbound and westbound approaches at U Street/Tulare Street • Widening the eastbound approach to provide two exclusive through lanes and one exclusive through lanes and one exclusive right-turn lane at the intersection of SR 99 southbound ramps/Fresno Street • Restriping the eastbound approach to provide two exclusive left-turn lanes and one exclusive through lane at SR 99 northbound ramps/Fresno Street (Tulare Street Underpass Option) • Restriping the westbound approach to provide one through lane, one shared through/right-turn lane, and one exclusive right-turn lane at SR 99 northbound ramps/Fresno Street (Tulare Street Overpass Option) • Widening the southbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one exclusive right turn lane at the intersection of Van Ness Avenue/Fresno Street (Tulare Street Underpass Option) • Widening the northbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane and widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at the intersection of Van Ness Avenue/Fresno Street (Tulare Street Overpass Option) • Modifying the existing traffic signal to provide split phases for the eastbound and westbound approaches at the intersection of Fresno Street/Divisadero Street • Widening eastbound approach to provide one exclusive left-turn lane, one through lane and one exclusive right-turn lane at Van Ness Avenue/Tuolumne Street • Restriping the westbound approach to provide one shared left/though lane, one through lane, and one shared through/right-turn lane; restriping the southbound approach to provide one shared left/through lane and one exclusive right-turn lane; and modifying signal phasing to provide split phasing on eastbound and westbound approaches at E Street/Stanislaus Street (Tulare Street Overpass Option only) • Restriping the southbound approach to provide shared left/through lane and one exclusive right-turn lane and modifying the signal phasing to provide permissive phase on northbound and southbound approaches at Broadway Street/Stanislaus Street (Tulare Street Overpass Option only) • Widening westbound approach to provide one exclusive left turn lane, one through lane and one shared through/right-turn lane at Van Ness Avenue/Stanislaus Street (Tulare street Underpass Option only) • Signalizing the intersection at H Street/San Joaquin Street • Signalizing the intersection and widening southbound approach to provide on exclusive left-turn lane and one through lane at H Street/Amador Street • Restriping the westbound approach to provide one shared through/right/left-turn lane and two exclusive right-turn lanes; widening the northbound approach to provide two exclusive left-turn lanes and one shared through/right-turn lane; and widening the southbound approach to							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	provide additional left turn lane (on H Street) at H Street/Divisadero Street • Widening the eastbound approaches to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane and widening the westbound approach to provide one shared left/through lane, one exclusive through lane, and one exclusive right-turn lane at the intersection of Van Ness Avenue/Divisadero Street • Widening the westbound approach (S Street) to provide one shared through/right-turn lane, one exclusive through lane, and one exclusive left0turn lane at H Street/Roosevelt Street • Widening the westbound approach to provide one exclusive left turn lane and one exclusive through lane at North Blackstone Avenue/East McKenzie Avenue • Restriping the northbound approach to provide one exclusive through lane, one shared through/right0turn lane, and one exclusive right-turn lane at the intersection of Van Ness Avenue/SR 180 eastbound ramps • Widening the eastbound approach to provide one additional exclusive left-turn lane at the intersection of Van Ness Avenue/SR 180 westbound ramps • Widening the southbound approach to provide one exclusive left-turn lane, two exclusive through lanes, and one shared through/right-turn lane at the intersection of North Blackstone Avenue/East Belmont Avenue • Restriping the northbound approach to provide one shared left/through lane, one exclusive through lane, one shared through/right-turn lane, and one exclusive right-turn lane at the intersection of North Abby Street/SR 180 eastbound ramps • Widening the eastbound approach to provide one additional exclusive right-turn lane at the intersection of North Blackstone Avenue/SR 180 westbound ramps • Signalizing the intersection at Broadway Street/Amador Street • Restriping the northbound approach to provide one exclusive left-turn lane, on exclusive through lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, two through lanes and one exclusive right-turn lane; and widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at Fresno Street/F Street (Tulare Street Underpass Option) • Restriping the northbound approach to provide one exclusive left-turn lane, one exclusive through lane, and one shared through/right-turn lane; widening the westbound approach to provide one exclusive left-turn lane, one through lane, one shared through/right-turn lane, and one exclusive right-turn lane; widening the eastbound approach to provide two exclusive left-turn lanes, one through lane, and one shared through/right-turn lane at Fresno Street/F Street (Tulare Street Overpass Option) • Signalizing the intersection at H Street/Ventura Street (Tulare Street Underpass Option only) • Signalizing the intersection at G Street/Mono Street (Tulare Street Underpass Option only) • Signalizing the intersection; widening northbound approach to provide							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	exclusive left-turn lane; widening southbound approach to provide exclusive left-turn lane; and modifying signal phasing on northbound and southbound approaches to provide protected plus permissive left-turn phasing at the intersection of South Van Ness Avenue/East California Street • Providing an exclusive right-turn lane in the northbound direction and modifying signal phasing on all approaches to provide protected plus permissive left turn phase at Golden State Boulevard/East Church Avenue • Increasing the cycle length (in the PM Peak Hour only) at South East Avenue/Golden State Boulevard • Providing an exclusive right-turn lane for both northbound and southbound approaches at Golden State Boulevard/East Jensen Avenue • Widening the northbound approach to provide one exclusive left-turn lane and two exclusive right-turn lanes at Stanislaus Street/F Street (Tulare Street Overpass Option only) • Restriping the eastbound approach to provide one exclusive left-turn lane, one shared left/through lane and one exclusive right0turn lane at Tuolumne Street/F Street (Tulare Street Overpass Option only) • Widening the northbound approach to provide one exclusive left-turn lane and one shared through/right-turn lane at Stanislaus Street/L Street • Widening the southbound approach to provide one shared left/through lane and one exclusive right-turn lane at Stanislaus Street/M Street • Widening the westbound approach to provide one exclusive left-turn lane, one through lane and one shared through/right-turn lane at Stanislaus Street/N Street							
	TR MM#9: Convert Two-Way Stop to Four-Way Stop. Convert two-way stop controlled intersection to an all-way stop controlled intersection. Merced Station • 14th Street/O Street (Option A only) Fresno Station • n/a	**Implementing Party:** Contractor will prepare construction plans and provide copies to affected jurisdictions. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance as identified in construction plans.				X	Prepare construction management plan/maintain weekly reporting schedule	Contract Requirements/Specifications
Air Quality and Global Climate Change								
AQ#1: Regional Impacts. Construction of the HST alternatives would exceed the emissions thresholds for volatile organic compound (VOC) and nitrogen oxide (NO_x). Therefore, it could potentially cause violations of nitrogen	**AQ-MM#1: Reduce Criteria Exhaust Emissions from Construction Equipment.** This mitigation measure will apply to heavy-duty construction equipment used during the construction phase. All off-road construction diesel equipment will use the cleanest reasonably available equipment (including newer equipment and/or tailpipe retrofits), but in no case less clean than the average fleet mix, as set forth in CARB's Non-Road/Off-Road 2007 database. The contractor will document efforts it undertook to locate newer equipment (such as, in order of priority, Tier 4, Tier 3 or Tier 2 equipment) and/or tailpipe retrofit equivalents. The contractor shall provide documentation of such efforts, including correspondence with at least two construction equipment rental companies. A copy of each unit's certified tier specification and any required CARB or SJVAPCD operating permit will be made available at the time of	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager will verify that appropriate measures are incorporated into construction specifications.		X			Daily Recording/Weekly Reporting	A copy of each unit's certified tier specification and any required California Air Resources Board (CARB) or San Joaquin valley Air Pollution Control District (SJVAPCD) operating permit will be made available at the time of mobilization of each piece of equipment. When non-retrofitted Tier 3 engines are utilized, the contractor will document that no Tier 4 equipment

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
dioxide (NO_2) and ozone (O_3) air quality standards or contribute substantially to NO_2 and O_3 existing or projected air quality violations	mobilization of each piece of equipment. The contractor shall keep a written record (supported by equipment hours meters where available) of equipment usage during project construction for each piece of equipment.							or emissions equivalent retrofit equipment is available or practicable for a particular equipment type. Documentation will be provided in such instances by the contractors and at least two construction equipment rental companies.
VOC and NO_x emissions would exceed GC applicability thresholds for most of the construction phase with or without onsite mitigation (such as AQ-MM #1), and CO, PM_{10} and $PM_{2.5}$, and SO_2 emissions would be below the GC thresholds for all construction years. As such, with implementation of AQ-MM#4, which will offset construction phase VOC and NO_x emissions through the VERA program, the project would have impacts of negligible intensity for all pollutants.	**AQ-MM#2: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment.** This mitigation measure applies to on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel. Material hauling trucks will consist of an average fleet mix of equipment model year 2010 or newer, to the extent reasonably practicable. The contractor shall provide documentation of efforts to secure such fleet mix. The contractor shall keep a written record of equipment usage during project construction for each piece of equipment.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager will verify compliance of this measure during construction.		X			Prior to construction/weekly reporting	Contract Requirements/ Specifications
	AQ-MM#4: Offset Project Construction Emissions through a SJVAPCD Voluntary Emission Reduction Agreement (VERA). The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's actual emissions that exceed thresholds by providing funds for the district's Emission Reduction Incentive Program[2] (SJVAPCD, 2011) to fund grants for projects that achieve emission reductions, thus offsetting project-related impacts on air quality. The project will reduce actual construction emissions that exceed significance/General Conformity thresholds for NO_x and VOC through the VERA program. At a minimum, mitigation/offsets shall occur in the year of impact, or as otherwise permitted by 40 CFR Part 93 Section 93.163.	**Implementing Party:** Contractor and Authority **Monitoring/Reporting Parties:** Authority & SJVAPCD		X			Prior to construction/weekly reporting	The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's emissions by providing funds for the district's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project-related impacts on air quality.
AQ#2: Regional Impacts. Material hauling outside the SJVAB would exceed CEQA emission thresholds for NO_x in the Bay Area Air Quality Management District (AQMD), East Kern APCD, Mojave	AQ-MM#2: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment. This measure is described above.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager will verify this measure is implemented during construction.		X			Construction/Weekly reporting	Contract Requirements/ Specifications
	AQ-MM#5: Purchase Offsets and Offsite Emissions Mitigation Associated with Hauling Ballast Material in certain air districts. Actual NO_X emissions from ballast hauling shall be reported to the South Coast AQMD and offsets purchased from the South Coast AQMD for actual emissions exceeding the thresholds. In the Bay Area AQMD, actual NO_X emissions above the district's significance threshold will be mitigated through an offsite emission	**Implementing Party:** The Authority **Monitoring/Reporting Party:** Mitigation Manager will review plans to confirm compliance with this measure.	X	X			Prior to construction/weekly reporting	Authority to coordinate the purchase of offsets with pertinent AQMDs.

2 See San Joaquin Valley Air Pollution Control District (SJVAPCD). 2011. *Grant and Incentive Programs*. Available at www.valleyair.org/Grant_Programs/GrantPrograms.htm.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Desert AQMD, and the SCAQMD for certain hauling scenarios. Therefore, it could potentially cause violations of NO_2 and O_3 air quality standards or contribute substantially to NO_2 and O_3 existing or projected air quality violations in those air districts.	mitigation program to achieve emission reduction due to material hauling in Bay Area AQMD. Potential offsite mitigation programs include the Bay Area AQMD's Carl Moyer Memorial Air Quality Standards Attainment Program (CMP) or other air district emission reduction incentive programs.							
AQ#3: Compliance with Air Quality Plans. Construction of the HST alternatives would exceed the emissions thresholds for VOC and NO_x. Therefore, it would conflict with the 1-hour Ozone Attainment Plan and the 8-hour Ozone Attainment Plan.	AQ-MM#1: Reduce Criteria Exhaust Emissions from Construction Equipment This measure is described above.	**Implementing Party:** Contractor will incorporate appropriate measures into construction specifications. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.		X			Construction/weekly reporting	A copy of each unit's certified tier specification and any required California Air Resources Board (CARB) or San Joaquin valley Air Pollution Control District (SJVAPCD) operating permit will be made available at the time of mobilization of each piece of equipment. When non-retrofitted Tier 3 engines are utilized, the contractor will document that no Tier 4 equipment or emissions equivalent retrofit equipment is available or practicable for a particular equipment type. Documentation will be provided in such instances by the contractors and at least two construction equipment rental companies.
	AQ-MM#2: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment This measure is described above.	**Implementing Party:** Contractor will incorporate appropriate measures into construction specifications. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.		X			Construction/weekly reporting	Contract Requirements/Specifications
	AQ-MM#4: Offset Project Construction Emissions through a SJVAPCD Voluntary Emission Reduction Agreement (VERA). This measure is described above.	**Implementing Party:** Contractor **Monitoring/Reporting Parties:** Authority & SJVAPCD		X			Construction/weekly reporting	The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's emissions by providing funds for the district's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project-related impacts on air quality.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	AQ-MM#3: Reduce the Potential Impact of Concrete Batch Plants. Concrete batch plants will be sited at least 1,000 feet from sensitive receptors, including daycare centers, hospitals, senior care facilities, residences, parks, and other areas where people may congregate.	**Implementing Party:** Contractor will identify location of concrete batch plants on construction plans and verify location is away from sensitive receptors. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.	X	X			Construction/weekly reporting	Contract Requirements/Specifications
AQ# 4: Local Impacts. Construction of the alignment may expose sensitive receptors to temporary substantial pollutant concentrations from concrete batch plants.	**AQ-MM#3: Reduce the Potential Impact of Concrete Batch Plants.** Concrete batch plants will be sited at least 1,000 feet from sensitive receptors, including daycare centers, hospitals, senior care facilities, residences, parks, and other areas where people may congregate.	**Implementing Party:** Contractor will identify location of concrete batch plants on construction plans and verify location is away from sensitive receptors. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.	X	X			Construction/weekly reporting	Contract Requirements/Specifications
Noise and Vibration								
N&V#1: Construction Noise Construction impacts would have moderate intensity under NEPA, but due to the temporary nature and adherence to local noise ordinances, construction noise and vibration impacts would not be significant under NEPA. FRA may choose to implement these mitigation measures.	**N&V-MM#1: Construction noise mitigation measures.** Monitor construction noise to verify compliance with the limits. Provide the contractor the flexibility to meet the FTA construction noise limits in the most efficient and cost-effective manner. The contractor would have the flexibility of either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. To meet required noise limits, the following noise control mitigation measures will be implemented as necessary, for nighttime and daytime: • Install a temporary construction site sound barrier near a noise source. • Avoid nighttime construction in residential neighborhoods. • Locate stationary construction equipment as far as possible from noise-sensitive sites. • Re-route construction-related truck traffic along roadways that will cause the least disturbance to residents. • During nighttime work, use smart back-up alarms, which automatically adjust the alarm level based on the background noise level, or switch off back-up alarms and replace with spotters. • Use low-noise emission equipment. • Implement noise-deadening measures for truck loading and operations. • Monitor and maintain equipment to meet noise limits. • Line or cover storage bins, conveyors, and chutes with sound-deadening material. • Use acoustic enclosures, shields, or shrouds for equipment and facilities. • Use high-grade engine exhaust silencers and engine-casing sound insulation. • Prohibit aboveground jackhammering and impact pile driving during	**Implementing Party:** Contractor to incorporate measures into specifications. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.		X			Construction/weekly reporting	Contract Requirements/ Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	nighttime hours. • Minimize the use of generators to power equipment. • Limit use of public address systems. • Grade surface irregularities on construction sites. • Use moveable sound barriers at the source of the construction activity. • Limit or avoid certain noisy activities during nighttime hours. To mitigate noise related to pile driving, the use of an augur to install the piles instead of a pile driver would reduce noise levels substantially. If pile driving is necessary, limit the time of day that the activity can occur.							
N&V#3: Severe Operational Noise Impacts	**N&V-MM#3: Implement California High-Speed Train Project Noise and Vibration Mitigation Guidelines.** California High-Speed Train Project Noise and Vibration Mitigation Guidelines (Guidelines) will be applied for ballast and tie track along the alignment. These Noise Guidelines will also be applied for slab track along the alignment. Various options exist to address the potentially severe noise effects from HSTs and from shifting SR 99. With input from local jurisdictions and balancing technological factors, such as structural and seismic safety, cost, number of affected receptors, and effectiveness, mitigation measures from among those identified in the Guidelines and summarized below will be selected and implemented. The mitigation measure or suite of mitigation measures for severe noise impacts will be designed to reduce the noise level from HST operations from "severe" to "moderate" according to the provisions of the FRA noise and vibration manual (FRA 2005). The Guidelines include the following mitigation measures for severe operational noise impacts: • Install sound barriers. Depending on the height and location relative to the tracks, sound barriers can achieve between 5 and 15 dB of noise reduction. The primary requirements for an effective sound barrier are that the barrier must (1) be high enough and long enough to break the line-of-sight between the sound source and the receiver, (2) be of an impervious material with a minimum surface density of 4 pounds per square foot, and (3) not have any gaps or holes between the panels or at the bottom. Because many materials meet these requirements, aesthetics, durability, cost, and maintenance considerations usually determine the selection of materials for sound barriers. Depending on the situation, sound barriers can become visually intrusive. Typically, the sound barriers style is selected with input from the local jurisdiction to reduce the visual effect of barriers on adjacent lands uses. For example, sound barriers could be solid or transparent, of various colors, materials, and surface treatments. • The maximum sound barrier height would be 14 feet for at-grade sections; however, all sound barriers would be designed to be as low as possible while still achieving a substantial noise reduction. Berm and berm/wall combinations are the preferred types of sound barriers where space and other environmental constraints permit. Work with the communities to	**Implementing Party:** Contractor to identify noise barriers in construction plans. Where noise barriers are not applicable, the Contractor will identify and document mitigation to be implemented for individual properties in consultation with the Authority's right-of-way team and the property owner. The post-construction contractor will address remaining mitigation implementation. **Monitoring/Reporting Party:** Mitigation Manager will review construction plans and identified mitigation documentation to verify compliance with measure.	X	X	X		Construction/weekly reporting	Noise and Vibration Mitigation Guidelines

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	determine how the use and height of sound barriers would be determined using jointly developed performance criteria. Other solutions may result in higher numbers of residual impacts than reported herein. Options may be to reduce the height of sound barriers and combine barriers with sound insulation or to accept higher than the FRA's current noise thresholds. • Install building sound insulation. Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor noise reduction is a mitigation measure that can be provided when the use of sound barriers is not feasible in providing a reasonable level (5 to 7 dB) of noise reduction. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where sound barriers are not feasible or desirable and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dB) can often be achieved by adding an extra layer of glazing to windows, by sealing holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air conditioning so that windows do not need to be opened. Establish performance criteria to balance existing noise events and ambient roadway noise conditions as factors for determining mitigation measures. • Acquire easements on properties severely affected by noise. Another option for mitigating noise impacts is for the Authority to acquire easements on residences likely to be affected by HST operations in which the homeowners would accept the future noise conditions. This approach is usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly.							
	N&V-MM#4: Vehicle Noise Specification. In the procurement of an HST vehicle technology, the Authority will require bidders to meet the federal regulations (40 CFR Part 201.12/13 or other applicable) at the time of procurement for locomotives (currently a 90-dB level standard) and rail cars (currently a 93-dB level standard for cars operating at speeds of greater than 45 mph). Depending on the available technology, this could significantly reduce the number of impacts throughout the corridor.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager and Authority	X				Prior to construction/weekly reporting	HST vehicle technology procurement
	N&V-MM#5: Special Trackwork at Crossovers and Turnouts. Because the impacts of HST wheels over rail gaps at turnouts increases HST noise by approximately 6 dB over typical operations, turnouts can be a major source of noise impact. If the turnouts cannot be moved from sensitive areas, the project can use special types of trackwork that eliminate the gap.	**Implementing Party:** Contractor/Authority **Monitoring/Reporting Party:** Mitigation Manager to report noncompliance/noise issues				X	Post Construction/Operations Monitoring. Authority to coordinate with local jurisdictions to address noise-related issues.	
	N&V-MM#6: Additional Noise Analysis During Final Design. If final design of the track base or final vehicle specifications results in changes to the assumptions underlying the noise analysis, reassess noise impacts and recommendations for mitigation and provide supplemental environmental documentation, as required by CEQA and NEPA.	**Implementing Party:** Final Design Team **Monitoring/Reporting Party:** Mitigation Manager in coordination with Authority.	X	X			Prepare construction management plan/weekly reporting	Noise impact re-assessment during final project design

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Biological Resources								
The following mitigation measures will be implemented, as applicable, during the construction period and the project period to avoid and or minimize impacts and effects on biological resources.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. Prior to ground-disturbing activities, the Mitigation Manager or designee will prepare and implement a WEAP for construction crews. WEAP training materials will include the following: discussion of the federal ESA, CESA, BGEPA, and the MBTA; consequences and penalties for violation or noncompliance with these laws and regulations and project permits; identification and value of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities; hazardous substance spill prevention and containment measures; the contact person in the event of the discovery of a dead or injured wildlife species; and review of mitigation measures. In the WEAP, the Mitigation Manager will detail construction timing in relation to habitat and species' life stage requirements and discuss project maps, showing areas of planned minimization and avoidance measures. A fact sheet prepared by the Mitigation Manager conveying this information will be prepared for distribution to the construction crews and to other individuals who enter the construction footprint. Upon completion of the WEAP training, construction crews will sign a form stating that they attended the training and understand and will comply with the information presented. Construction crews will be informed during the WEAP training that, to the extent possible, travel within the marked project site will be restricted to established roadbeds. Established roadbeds include all pre-existing and project-constructed unimproved, as well as improved roads.	**Implementing Party:** Contractor's Biologist and Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to maintain records of Worker Environmental Awareness training and provide written documentation to the Authority.	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. Prior to ground-disturbing activities, the Contractor will prepare and implement a Weed Control Plan to minimize or avoid the spread of weeds during ground-disturbing activities. The Weed Control Plan will address the following: • Schedule for conducting noxious weed surveys to be conducted in coordination with the Biological Resources Management Plan (BRMP). • Success criteria for noxious and invasive weed control as established by a qualified biologist. The success criteria will be linked to the Habitat Mitigation and Monitoring Plan (HMMP) for compensatory mitigation sites, and the standards for onsite work during construction will limit invasive species to less than 5% and non-native herbaceous species to less than 25%. If these success criteria have not been met by the end of the BRMP monitoring and implementation period, monitoring and control efforts will continue and remedial actions will be identified and implemented until success criteria are met. Based on monitoring results, additional or revised measures may be needed to ensure the introduction and spread of noxious weeds is not promoted by the construction and operation of the HST. • Provisions to ensure that the development of the Weed Control Plan will be coordinated with development of the Restoration and Revegetation Plan (RRP) so that the RRP incorporates measures to reduce the spread and	**Implementing Party:** Contractor's Biologist **Reporting Party/Monitoring Party:** Project Biologist in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	establishment of noxious weeds and incorporates percent cover of noxious weeds into revegetation performance standards. Identify weed control treatments including permitted herbicides, and manual and mechanical methods for application. Restrict herbicide application from use in environmentally sensitive areas (ESAs). • Determine timing of the weed control treatment for each plant species. • Identify fire prevention measures. The Contractor will implement the Weed Control Plan during the construction period and require that maintenance crews follow the guidelines in the Weed Control Plan during the project period. The Authority or its designee will appoint the responsible party during the operations period. A monthly memorandum will be prepared by the Project Biologist to document the progress of the Plan and its implementation.							
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. During final design, and prior to construction, the Project Biologist will prepare the Biological Resources Management Plan (BRMP), and assemble the biological resources mitigation measures. In the BRMP, the Project Biologist will include terms and conditions from applicable permits and agreements and make provisions for monitoring assignments, scheduling, and responsibility. The BRMP will also include habitat replacement and revegetation, protection during ground-disturbing activities, performance (growth) standards, maintenance criteria, and monitoring requirements for temporary and permanent native plant community impacts. The BRMP will form the parameters for the biology mitigation measures from this EIR/EIS, including terms and conditions as applicable from the USFWS, USACE, SWRCB, and CDFG permits. The BRMP will be prepared for all phases of project implementation, but may be exclusively prepared for each construction package. The goal of the BRMP is to assist the Project Biologist with an organized reporting tool to ensure the mitigation measures and terms and conditions are implemented in a timely manner and are reported on. These include all avoidance, minimization, repair, mitigation, and compensatory actions stated in the mitigation measures or terms and conditions from the permits referenced above. These measures and conditions are tracked through final design, implementation, and post-construction phases. Specific performance standards are habitat-based and are related to success of onsite or offsite repair of temporary impacts, or more permanent impacts that are compensated at an offsite location. Habitat based mitigation applies to compensatory mitigation or permittee-responsible mitigation for impacts on special-status plants, special-status wildlife, special-status plant communities, or jurisdictional waters and are generally addressed in the Bio-MM#58 as part of the HMMP. Performance standards are targets for determining the effectiveness of the mitigation and assessing the need for adaptive management (e.g., mitigation design or maintenance revisions). Success criteria are formal criteria that must be met after a specific timeframe to meet regulatory requirements of the permitting agencies. These are habitat-based performance standards that include consideration for the	**Implementing Party:** Contractor's Biologist **Monitoring/Reporting Party:** Project Biologist to verify completion of the BRMP and provide written documentation to the Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. BRMP and construction plans

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	establishment of a species or habitat. Since species are nested within habitats, the performance standards are primarily based on vegetation, substrate, and hydrology conditions. The performance standards for the establishment of any temporary or permanent impacts on these resources are recognized in those resource categories, but are more specifically covered in the specific performance standards/guidelines shown in Bio-MM#56. The overarching goal is to neutralize the impacts with respect to species and habitat impacted. The BRMP will help the long-term perpetuation of biological resources within the temporarily disturbed areas, as well as protect adjacent targeted habitats. The BRMP will contain but not be limited to the following information: a. Specific measures for the protection of special-status species. b. Identification (on construction plans) of the locations and quantity of habitats to be avoided or removed, including locations where habitats are to be restored. c. Procedures for vegetation analyses of temporarily impacted habitats to approximate their relative composition, as well as procedures for site preparation, irrigation, planting, and maintenance. This information may be used to determine the requirements of the revegetation areas for both onsite temporary impacts and offsite compensatory sites. d. Sources of plant materials and methods of propagation. e. Specific parameters for determining the amount of replacement habitat for temporary disturbance areas identified consistent with mitigation ratios and permit conditions. f. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas. g. Specification of performance standards for the re-established plant communities within the construction limits. h. Remedial measures, such as a form of adaptive management, to be taken if performance standards are not met. i. Methodologies and requirements for monitoring the restoration/replacement efforts, which will be a combination of qualitative and quantitative data consistent with mitigation measures and permit conditions. j. Measures to preserve topsoil and control erosion. k. Design of protective fencing around ESAs and ERAs and the construction staging areas. l. Specification of location and quantities of gallinaceous guzzlers (catch basin/artificial watering structures) if needed; specification of monitoring of water levels in guzzlers. m. Location of trees to be protected as wildlife habitat (roosting sites) and locations for planting replacement trees. n. Specification of the purpose, type, frequency, and extent of chemical use for insect and disease control operations as part of vegetative maintenance within sensitive habitat areas.							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	o. Specific construction monitoring programs for habitats of concern and special-status species, as needed. p. Specific measures for the protection of vernal pool habitat and riparian areas. These measures may include but are not limited to: erosion and siltation control measures, protective fencing guidelines, dust control measures, grading techniques, construction area limits, and biological monitoring requirements. q. Provisions for biological monitoring during ground-disturbing activities to confirm compliance and success of protective measures. The monitoring procedures will: (1) identify specific locations of wildlife habitat and sensitive species to be monitored, (2) identify the frequency of monitoring and the monitoring methodology (for each habitat and sensitive species to be monitored), (3) list required qualifications of biological monitor(s), and (4) identify reporting requirements.							
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. During final design, the Contractor's Biologist will prepare a restoration and revegetation plan (RRP) for upland communities and verified by the Project Biologist. This is a complement for site restoration in addition to the temporary effects for riparian plant communities (Bio-MM#15) and for jurisdictional waters (Bio-MM#43). In the RRP, address impacts on habitat subject to temporary ground disturbances that will require decompaction or regrading, if appropriate. The standards for onsite work during construction will limit invasive species to less than 5% and nonnative herbaceous species to less than 25% unless otherwise called out in the final approved seed mix. The Project Biologist will approve the seed mix. During ground-disturbing activities, the Contractor will implement the RRP in temporarily disturbed areas. The Project Biologist will prepare and submit compliance reports to document implementation. The RRP compliance reports will be prepared and submitted to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). Prior to ground-disturbing activities, to the extent practicable, the Project Biologist will verify that environmentally sensitive areas (ESAs) and environmentally restricted areas (ERAs) are delineated as appropriate. ESAs are areas within the construction zones containing suitable habitat for special-status species and habitats of concern that may allow construction activities, but have restrictions based on the presence of special-status species or habitats of concern at the time of construction. ERAs are areas outside the construction footprint that must be protected in-place during all construction activities. Prior to ground-disturbing activities, the Contractor's Biologist will include all ESAs and ERAs on final construction plans (including grading and landscape plans). Prepare, review and approve the map of all ESAs and ERAs on the design drawings and work to update the map as necessary. Prior to ground-disturbing activities, the Contractor will mark ESAs and ERAs with high visibility temporary fencing to prevent encroachment of construction	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	personnel and equipment onto sensitive areas. Designate the two categories, ESA and ERA, differently in the field (e.g., different colored flagging/fencing). Use sub-meter accurate GPS equipment to delineate all ESAs and ERAs. Remove ESA and ERA fencing when construction is complete or the resource has been cleared according to agency permit conditions and construction drawings and specifications. The Project Biologist will submit memoranda regarding the field delineation of all ESAs/ERAs to the Mitigation Manager. These areas will receive ongoing monitoring during site preparation and construction activities.							
	Bio-MM#8: Equipment Staging Areas. Prior to ground-disturbing activities, the Contractor will locate staging areas for construction equipment outside sensitive biological resources including habitat for special-status species, habitats of concern(e.g., wetlands, waters of the U.S., riparian communities), and wildlife movement corridors, to the maximum extent possible. The Project Biologist will submit memoranda to the Mitigation Manager documenting compliance. Where avoidance is not feasible the permitting authorities need to be contacted for modification to permits, as required by law.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#9: Mono-Filament Netting. During ground-disturbing activities, the Project Biologist will verify that plastic mono-filament netting (erosion-control matting) or similar material is not used in erosion control materials; substitutes include coconut hair matting or tackified hydroseeding compounds. The Project Biologist will submit memoranda to the Mitigation Manager documenting compliance monthly, or as appropriate, through the life of the project construction.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X			During ground-disturbing activities and Construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. During ground-disturbing activities, the Contractor will restrict project-related vehicle traffic, within the construction area, to established roads, construction areas, and other designated areas. Establish vehicle traffic locations disturbed by previous activities to prevent further adverse effects. Observe a 20 mph speed limit for construction areas with potential special-status species habitat. Clearly flag and mark access routes and prohibit off-road traffic. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#11: Entrapment Prevention. The Contractor's biologist will cover all excavated, steep-sided holes or trenches, more than 8 inches deep, at the close of each working day with plywood or similar materials, or provide a minimum of one escape ramp per 10 feet of trenching constructed of earth fill. The Contractor's Biologist will thoroughly inspect such holes or trenches for trapped animals before leaving the construction site each day. Prior to construction, the Contractor's Biologist will screen all culverts, or similar enclosed structures, with a diameter of 4 inches or greater to prevent use by wildlife. The Contractor's Biologist will ensure that cleared and stored material at the construction site for common and special-status wildlife species before the material is subsequently used or moved. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During construction/submit weekly reports.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	basis.							
	Bio-MM#12: Work Stoppage. During ground-disturbing activities, the Project Biologist or Biological Monitor will halt work in the event that a special-status wildlife species gains access to the construction footprint. This work stoppage will be coordinated with the resident engineer and/or the Authority or its designee. At this direction the Contractor will suspend ground-disturbing activities in the immediate construction area that could reasonably result in a "take" of special-status wildlife species. The Contractor will continue the suspension until the individual leaves voluntarily, is relocated to a release area using USFWS- and/or CDFG-approved handling techniques and relocation methods, or as required by USFWS or CDFG. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist in coordination with the Authority **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. The Contractor's Biologist in coordination with the Project Biologist and Mitigation Manager will notify the USFWS and/or CDFG immediately in the case of an accidental death or injury to a federal or state listed species during project-related activities. The Authority or its designee will be notified prior to the notification to the agencies. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. After each construction period is completed, the Project Biologist will submit post-construction compliance reports consistent with the appropriate agency (e.g., UFSWS, NMFS and CDFG) protocols, including compliance with resource agency permits (i.e., Section 7 of FESA, Section 2081 of CESA and Section 401 and 404 of FCWA and 1600 of Fish and Game Code). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance. The frequency of the memorandum compilation and submission will be consistent with regulatory compliance permits.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
Bio#1: Construction of the HST alternatives would introduce noxious weeds.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** Prior to ground-disturbing activities, the Contractor will prepare and implement a Weed Control Plan to minimize or avoid the spread of weeds during ground-disturbing activities. The Weed Control Plan will address the following: • Schedule for conducting noxious weed surveys to be conducted in coordination with the BRMP. • Success criteria for noxious and invasive weed control as established by a qualified biologist. The success criteria will be linked to the HMMP for compensatory mitigation sites, and the standards for onsite work during construction will limit invasive species to less than 5% and non-native herbaceous species to less than 25%. If these success criteria have not been met by the end of the BRMP monitoring and implementation period, monitoring and control efforts will continue and remedial actions will be identified and implemented until success criteria are met. Based on monitoring results, additional or revised measures may be needed to ensure	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract Weed Control Plan

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	the introduction and spread of noxious weeds is not promoted by the construction and operation of the HST. • Provisions to ensure that the development of the Weed Control Plan will be coordinated with development of the Restoration and Revegetation Plan (RRP) so that the RRP incorporates measures to reduce the spread and establishment of noxious weeds and incorporates percent cover of noxious weeds into revegetation performance standards. Identify weed control treatments including permitted herbicides, and manual and mechanical methods for application. Restrict herbicide application from use in environmentally sensitive areas (ESAs). • Determine timing of the weed control treatment for each plant species. • Identify fire prevention measures. The Contractor will implement the Weed Control Plan during the construction period and require that maintenance crews follow the guidelines in the Weed Control Plan during the project period. The Authority or its designee will appoint the responsible party during the operations period. A monthly memorandum will be prepared by the Project Biologist to document the progress of the Plan and its implementation.							
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. During final design, and prior to construction, the Project Biologist will prepare the BRMP, and assemble the biological resources mitigation measures. In the BRMP, the Project Biologist will include terms and conditions from applicable permits and agreements and make provisions for monitoring assignments, scheduling, and responsibility. The BRMP will also include habitat replacement and revegetation, protection during ground-disturbing activities, performance (growth) standards, maintenance criteria, and monitoring requirements for temporary and permanent native plant community impacts. The BRMP will form the parameters for the biology mitigation measures from this EIR/EIS, including terms and conditions as applicable from the USFWS, USACE, SWRCB, and CDFG permits. The BRMP will be prepared for all phases of project implementation, but may be exclusively prepared for each construction package. The goal of the BRMP is to assist the Project Biologist with an organized reporting tool to ensure the mitigation measures and terms and conditions are implemented in a timely manner and are reported on. These include all avoidance, minimization, repair, mitigation, and compensatory actions stated in the mitigation measures or terms and conditions from the permits referenced above. These measures and conditions are tracked through final design, implementation, and post-construction phases. Specific performance standards are habitat-based and are related to success of onsite or offsite repair of temporary impacts, or more permanent impacts that are compensated at an offsite location. Habitat-based mitigation applies to compensatory mitigation or permittee-responsible mitigation for impacts on special-status plants, special-status wildlife, special-status plant communities, or jurisdictional waters and are generally addressed in the Bio-MM#58 as part of the HMMP. Performance	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	standards are targets for determining the effectiveness of the mitigation and assessing the need for adaptive management (e.g., mitigation design or maintenance revisions). Success criteria are formal criteria that must be met after a specific timeframe to meet regulatory requirements of the permitting agencies. These are habitat-based performance standards that include consideration for the establishment of a species or habitat. Since species are nested within habitats, the performance standards are primarily based on vegetation, substrate, and hydrology conditions. The performance standards for the establishment of any temporary or permanent impacts on these resources are recognized in those resource categories, but are more specifically covered in the specific performance standards/guidelines shown in Bio-MM#56. The overarching goal is to neutralize the impacts with respect to species and habitat impacted. The BRMP will help the long-term perpetuation of biological resources within the temporarily disturbed areas, as well as protect adjacent targeted habitats. The BRMP will contain but not be limited to the following information: a. Specific measures for the protection of special-status species. b. Identification (on construction plans) of the locations and quantity of habitats to be avoided or removed, including locations where habitats are to be restored. c. Procedures for vegetation analyses of temporarily impacted habitats to approximate their relative composition, as well as procedures for site preparation, irrigation, planting, and maintenance. This information may be used to determine the requirements of the revegetation areas for both onsite temporary impacts and offsite compensatory sites. d. Sources of plant materials and methods of propagation. e. Specific parameters for determining the amount of replacement habitat for temporary disturbance areas identified consistent with mitigation ratios and permit conditions. f. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas. g. Specification of performance standards for the re-established plant communities within the construction limits. h. Remedial measures, such as a form of adaptive management, to be taken if performance standards are not met. i. Methodologies and requirements for monitoring the restoration/replacement efforts, which will be a combination of qualitative and quantitative data consistent with mitigation measures and permit conditions. j. Measures to preserve topsoil and control erosion. k. Design of protective fencing around ESAs and ERAs and the construction staging areas. l. Specification of location and quantities of gallinaceous guzzlers (catch basin/artificial watering structures) if needed; specification of monitoring of water levels in guzzlers.							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	m. Location of trees to be protected as wildlife habitat (roosting sites) and locations for planting replacement trees. n. Specification of the purpose, type, frequency, and extent of chemical use for insect and disease control operations as part of vegetative maintenance within sensitive habitat areas. o. Specific construction monitoring programs for habitats of concern and special-status species, as needed. p. Specific measures for the protection of vernal pool habitat and riparian areas. These measures may include but are not limited to: erosion and siltation control measures, protective fencing guidelines, dust control measures, grading techniques, construction area limits, and biological monitoring requirements. q. Provisions for biological monitoring during ground-disturbing activities to confirm compliance and success of protective measures. The monitoring procedures will: (1) identify specific locations of wildlife habitat and sensitive species to be monitored, (2) identify the frequency of monitoring and the monitoring methodology (for each habitat and sensitive species to be monitored), (3) list required qualifications of biological monitor(s), and (4) identify reporting requirements.							
Bio#2: Construction of the HST alternatives would disturb Great Valley mixed riparian forest and other riparian habitat.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio#1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract Weed Control Plan
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio#1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. During final design, the Contractor's Biologist will prepare a restoration and revegetation plan (RRP) for upland communities and verified by the Project Biologist. This is a complement for site restoration in addition to the temporary effects for riparian plant communities (Bio-MM#15) and for jurisdictional waters (Bio-MM#43). In the RRP, address impacts on habitat subject to temporary ground disturbances that will require decompaction or regrading, if appropriate. The standards for onsite work during construction will limit invasive species to less than 5% and nonnative herbaceous species to less than 25% unless otherwise called out in the final approved seed mix. The Project Biologist will approve the seed mix. During ground-disturbing activities, the Contractor will implement the RRP in temporarily disturbed areas. The Project Biologist will prepare and submit compliance reports to document implementation. The RRP compliance reports will be prepared and submitted to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). Prior to ground-disturbing activities, to the extent practicable, the Project Biologist will verify that environmentally sensitive areas (ESAs) and environmentally restricted areas (ERAs) are delineated as appropriate. ESAs are areas within the construction zones containing suitable habitat for special-status species and habitats of concern that may allow construction activities, but have restrictions based on the presence of special-status species or habitats of concern at the time of construction. ERAs are areas outside the construction footprint that must be protected in-place during all construction activities. Prior to ground-disturbing activities, the Contractor's Biologist will include all ESAs and ERAs on final construction plans (including grading and landscape plans). Prepare, review and approve the map of all ESAs and ERAs on the design drawings and work to update the map as necessary. Prior to ground-disturbing activities, the Contractor will mark ESAs and ERAs with high visibility temporary fencing to prevent encroachment of construction personnel and equipment onto sensitive areas. Designate the two categories, ESA and ERA, differently in the field (e.g., different colored flagging/fencing). Use sub-meter accurate GPS equipment to delineate all ESAs and ERAs. Remove ESA and ERA fencing when construction is complete or the resource has been cleared according to agency permit conditions and construction drawings and specifications. The Project Biologist will submit memoranda regarding the field delineation of all ESAs/ERAs to the Mitigation Manager. These areas will receive ongoing monitoring during site preparation and construction activities.	**Implementing Party:** Contractor's Biologist, Project Biologist, **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. Prior to ground-disturbing activities, the Contractor will locate staging areas for construction equipment outside sensitive biological resources including habitat for special-status species, habitats of concern(e.g., wetlands, waters of the U.S., riparian communities), and wildlife movement corridors, to the maximum extent possible. The Project Biologist will submit memoranda to the Mitigation Manager documenting compliance. Where avoidance is not feasible the permitting authorities need to be contacted for modification to permits, as required by law.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. During ground-disturbing activities, the Contractor will restrict project-related vehicle traffic, within the construction area, to established roads, construction areas, and other designated areas. Establish vehicle traffic locations disturbed by previous activities to prevent further adverse effects. Observe a 20 mph speed limit for construction areas with potential special-status species habitat. Clearly flag and mark access routes and prohibit off-road traffic. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#15: Restore Temporary Riparian Impacts. During post-construction, the Contractor's Biologist will revegetate all disturbed riparian areas using appropriate native plants and seed mixes. The Project Biologist will	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist			X		Post-construction. Follow reporting requirements as established by agency	Condition of Design/Build Contract Habitat Mitigation and Monitoring

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	monitor restoration activities consistent with provisions in the HMMP. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance and other reporting requirements in the 1600 Streambed Alteration Agreement.	**Monitoring Party:** Mitigation Manager in coordination with the Authority					permit conditions	Plan (HMMP) and Memorandum documenting compliance and other reporting requirements in the 1600 Streambed Alteration Agreement.
Bio#3: Construction of the HST alternatives would disturb suitable habitat that has potential to support special-status plant species.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. Prior to ground-disturbing activities, the Mitigation Manager or designee will prepare and implement a WEAP for construction crews. WEAP training materials will include the following: discussion of the federal ESA, CESA, BGEPA, and the MBTA; consequences and penalties for violation or noncompliance with these laws and regulations and project permits; identification and value of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities; hazardous substance spill prevention and containment measures; the contact person in the event of the discovery of a dead or injured wildlife species; and review of mitigation measures. In the WEAP, the Mitigation Manager will detail construction timing in relation to habitat and species' life stage requirements and discuss project maps, showing areas of planned minimization and avoidance measures. A fact sheet prepared by the Mitigation Manager conveying this information will be prepared for distribution to the construction crews and to other individuals who enter the construction footprint. Upon completion of the WEAP training, construction crews will sign a form stating that they attended the training and understand and will comply with the information presented. Construction crews will be informed during the WEAP training that, to the extent possible, travel within the marked project site will be restricted to established roadbeds. Established roadbeds include all pre-existing and project-constructed unimproved, as well as improved roads.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to the Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio#2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio#2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio#2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio#2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. After each construction period is completed, the Project Biologist will submit post-construction compliance reports consistent with the appropriate agency (e.g., UFSWS, NMFS and CDFG) protocols, including compliance with resource agency permits (i.e., Section 7 of FESA, Section 2081 of CESA and Section 401 and 404 of FCWA and 1600 of Fish and Game Code). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance. The frequency of the memorandum compilation and submission will be consistent with regulatory compliance permits.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#17: Conduct Pre-Construction Surveys for Special-Status Plant Species. The Project Biologist will conduct pre-construction surveys for special-status plant species in suitable habitat areas, subject to ground-disturbing activities. The surveys will be conducted in the appropriate season prior to ground-disturbing activities for salvage and relocation opportunities. The Project Biologist will use the results of the Special-Status Plants Survey Report (prepared as part of the Biological Resources Technical Report), including mapping of locations of special-status plant species, to determine focused locations for the pre-construction surveys, as appropriate. The Project Biologist will work with the Contractor's Biologist to mark and avoid locations of all special-status plant species observed where feasible or incorporate the species into the relocation/compensation program defined in Bio-MM#50: Compensate for Impacts on Special-Status Plant Species. Prior to ground-disturbing activities, the Contractor will protect any populations	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities for salvage and relocation activities. Report on weekly basis.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	of special-status plant species identified during the surveys within 100 feet of the construction footprint as ERAs. As appropriate, the Contractor's Biologist will update the special-status or habitats of concern mapping within the construction limits, based upon resource agency permits. The Contractor's Biologist will determine the locations of special-status plant species on construction drawings and identified as ESAs within the construction footprint. Plant populations within 100 feet of the construction limits will be fenced as ERAs by the Contractor's Biologist. Terms and conditions from Section 7 and Section 2081 agreements will be incorporated as appropriate. The Project Biologist will provide verification and report through memorandum to the Mitigation Manager.							
	Bio-MM#18: Prepare and Implement Plan for Salvage, Relocation, and/or Propagation of Special-Status Plant Species. The Contractor's Biologist will prepare a plan prior to ground-disturbing activities to address monitoring, salvage, relocation, and propagation of special-status plant species. The plan will be submitted to the Project Biologist for concurrence. The relocation or propagation of plants and seed will be performed at a suitable mitigation site, as appropriate per species. Documentation will include provisions that address the techniques, location, and procedures required for the successful establishment of the plant populations. The plan will include provisions for performance that address survivability requirements, maintenance, monitoring, implementation, and the annual reporting requirements. Permit conditions issued by the appropriate resource agencies (e.g., USFWS, CDFG) will guide the development of the plan and performance standards. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X		X		Pre-construction and prior to ground-disturbing activities. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
Bio#4: Construction of the HST alternatives would disturb suitable habitat that has potential to support vernal pool branchiopods	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio#3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. During ground-disturbing activities, the Project Biologist or Biological Monitor will halt work in the event that a special-status wildlife species gains access to the construction footprint. This work stoppage will be coordinated with the resident engineer and/or the Authority or its designee. At this direction the Contractor will suspend ground-disturbing activities in the immediate construction area that could reasonably result in a "take" of special-status wildlife species. The Contractor will continue the suspension until the individual leaves voluntarily, is relocated to a release area using USFWS- and/or CDFG-approved handling techniques and relocation methods, or as required by USFWS or CDFG. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. Prior to ground-disturbing activities, the Project Biologist will conduct pre-construction, non-protocol surveys in seasonally inundated habitats (seasonal wetland, non-inundated wetlands) within the construction footprint. The Project Biologist will conduct general aquatic surveys at a suitable	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory	Condition of Design/Build Contract Plan for monitoring, salvage, relocation, and propagation of special-status plant species and

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	interval after the first significant storm event of the rainy season (October 15 to June 1), as feasible prior to ground-disturbing activities. The sampling is an assessment of the hydrological, biological and ecological conditions of each seasonal wetland and open waters. This assessment will determine the quality and suitability of seasonal wetlands for special-status species (e.g., vernal pool branchiopods, western spadefoot toads, and California tiger salamanders) and later assist in determining which materials (e.g., soils, viable plant seeds, vernal pool cysts) may be collected. The sampling is an assessment that will be useful in understanding the species present and will help guide the implementation of performance standards to be consistent with Bio-MM#20: Implement and Monitor Vernal Pool Protection, for vernal pool special-status species (e.g., vernal pool branchiopods, western spadefoot toads, and California tiger salamanders).The Project Biologist will submit a report within 1 month of completing the field work and submit to the Mitigation Manager and Authority or its designee. The report will provide the documentation and the results of the sampling, including the results of the data collected and compared with the performance standards. All project construction personnel will be trained to recognize and avoid special-status species and their habitat (Bio-MM#3). The Weed Control Plan prepared and implemented (Bio-MM#4) will ensure that noxious weeds to not invade areas disturbed by project construction activities. The Plan will have specific success criteria in terms of future presence of invasive and non-native plant species in restored areas. Implementation of The Weed Control Plan will be integrated with the RRP (Bio-MM#6), and will be implemented and reported as part of the overall BRMP (Bio-MM#5). Prior to project construction ESAs and ERAs, which will include riparian areas adjacent to project construction, will be identified and delineated (Bio-MM#7) to prevent impacts to sensitive areas outside the approved project footprint. Construction equipment will be staged in non-sensitive areas (Bio-MM#8). During project construction vehicle routes and speeds will be controlled to minimize impact on sensitive habitats (Bio-MM#10). Riparian areas temporarily impacted through construction will be through a long-term restoration and monitoring program (Bio-MM#15). A plan will be implemented within the construction footprint and other areas potentially affected by construction activity to guide the salvage, relocation, and propagation special-status plant species (Bio-MM#18). This examination will include sampling and assessment of vernal pools (Bio-MM#19), which will provide baseline data necessary for formulation of performance standards necessary for subsequent mitigation of impacts to vernal pools and other aquatic resources. All of these activities will be documented though post-construction compliance reports (Bio-MM#14).						compliance permits.	Memorandum documenting compliance
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. For seasonal avoidance of special-status vernal pool branchiopods and vernal pool-dependent species (e.g., California tiger salamander), the Contractor will not work within 250 feet of aquatic habitats suitable for these species (e.g., vernal pools and other seasonal wetlands) from October 15 to June 1 (corresponding to the rainy season), or as determined through informal or formal consultation	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	with the USFWS or USACE. Ground-disturbing activities may begin once the habitat is no longer inundated for the season. If any work remains to be completed after October 15, exclusion fencing and erosion control measures will be placed at the vernal pools and other seasonal wetlands by the Contractor's Biologist. The fencing will act as a buffer between ground-disturbing activities and the vernal pools and other seasonal wetlands as determined through consultations with USFWS/USACE. The Project Biologist will document compliance through a memorandum to the Mitigation Manager during the establishment of the fencing activities.						determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	
	Bio-MM#21: Implement and Monitor Vernal Pool Protection. If construction impacts can be avoided, the vernal pool(s) will be protected by erecting exclusion fencing. The Contractor's Biologist, under the supervision of the Project Biologist, will erect and maintain the exclusion fencing. For construction impacts on vernal pools and other seasonal wetlands that cannot be avoided, the Contractor's Biologist will apply geotextile fabric and a layer of gravel over the affected vernal pool(s) prior to ground-disturbing activities to protect the contours in cases where the pool is not directly and permanently impacted from the construction footprint. The Contractor will implement this measure within the construction areas during one dry season period. Resource agency consultations with the USFWS/USACE will occur as needed and based on permit conditions. • If temporary impacts occur over a full wet-dry season cycle and the vernal pool(s) cannot be avoided, the vernal pool(s) will be protected by erecting exclusion fencing by the Contractor's Biologist. • If temporary impacts occur beyond the dry season (approximately June 1 to October 15) and the vernal pool(s) cannot be fenced, the Contractor's Biologist in coordination with the Project Biologist will collect a representative sampling of soils from the vernal pool(s) prior to initiating ground-disturbing activities within vernal pools. The representative soil sample(s) will contain viable plant seeds and vernal pool branchiopod cysts to be preserved from the vernal pool(s). These samples may be incorporated into other vernal pools, as applicable, with USFWS and/or CDFG consultation. If construction impacts take more than one full wet-dry season cycles, the offsite mitigation will be implemented.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post Construction monitoring and reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. During or post-construction, the Contractor will restore disturbed jurisdictional waters using stockpiled and segregated soils. The Contractor's Biologist will conduct revegetation using appropriate plants and seed mixes, and conduct maintenance monitoring consistent with the provisions in the HMMP. The Project Biologist will document compliance with memorandum submitted to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. During ground-disturbing activities, the Project Biological Monitor will conduct monitoring within jurisdictional waters, including monitoring of the installation of protective devices (silt fencing, sandbags, fencing, etc.), installation	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	and/or removal of creek crossing fill, construction of access roads, vegetation removal, and other associated construction activities. The Project Biological Monitor will conduct biological monitoring to document adherence to habitat avoidance and minimization measures addressed in the project mitigation measures and as listed in the USFWS, CDFG, SWRCB, and USACE permits conditions. The Project Biological Monitor will report and document compliance consistent with requirements in the permitting documents, including frequency and timing and submittals. All project construction personnel will be trained to recognize and avoid special-status species and their habitat (Bio-MM#3). The Weed Control Plan prepared and implemented (Bio-MM#4) will ensure that noxious weeds to not invade areas disturbed by project construction activities. The Plan will have specific success criteria in terms of future presence of invasive and non-native plant species in restored areas. Implementation of The Weed Control Plan will be integrated with the RRP (Bio-MM#6), and will be implemented and reported as part of the overall BRMP (Bio-MM#5). Prior to project construction ESAs and ERAs, which will include riparian areas adjacent to project construction, will be identified and delineated (Bio-MM#7) to prevent impacts to sensitive areas outside the approved project footprint. Construction equipment will be staged in non-sensitive areas (Bio-MM#8). During project construction vehicle routes and speeds will be controlled to minimize impact on sensitive habitats (Bio-MM#10). During construction, biological monitors will be empowered to temporarily halt construction activity to prevent impacts to observed special-status species (Bio-MM#12). Construction activity will be restricted in the vicinity of vernal pools during the period in which they are inundated (Bio-MM#19). In those instances where work must occur in proximity to pools, fencing and sedimentation protection will be installed. In instances where temporary impacts to vernal pools are unavoidable, soil from the pool will be collected to salvage viable plant seeds and vernal pool branchiopod cysts for use in subsequent mitigation (Bio-MM#20). Temporarily impacted wetlands will be restored using salvaged, stockpiled soils and appropriate seed mixes. Construction activity in wetland areas will be monitored to ensure that measures are taken to prevent impacts to adjacent wetlands and to assure adherence to relevant conditions of Resource Agency-issued permits (Bio-MM#44). All of these activities will be documented though post-construction compliance reports (Bio-MM#14).	the Authority					agency permit conditions.	
Bio#5: Construction of the HST alternatives would disturb suitable habitat that has potential to support the	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
valley elderberry longhorn beetle.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#11: Entrapment Prevention. The Contractor's Biologist will cover all excavated, steep-sided holes or trenches, more than 8 inches deep, at the close of each working day with plywood or similar materials, or provide a minimum of one escape ramp per 10 feet of trenching constructed of earth fill. The Contractor's Biologist will thoroughly inspect such holes or trenches for trapped animals before leaving the construction site each day. Prior to construction, the Contractor's Biologist will screen all culverts, or similar enclosed structures, with a diameter of 4 inches or greater to prevent use by wildlife. The Contractor's Biologist will ensure that cleared and stored material at the construction site for common and special-status wildlife species before the material is subsequently used or moved. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. During ground-disturbing activities, the Project Biologist or Biological Monitor will halt work in the event that a special-status wildlife species gains access to the construction footprint. This work stoppage will be coordinated with the resident engineer and/or the Authority or its designee. At this direction the Contractor will suspend ground-disturbing activities in the immediate construction area that could reasonably result in a "take" of special-status wildlife species. The Contractor will continue the suspension until the individual leaves voluntarily, is relocated to a release area using USFWS- and/or CDFG-approved handling techniques and relocation methods, or as required by USFWS or CDFG. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. The Contractor's Biologist in coordination with the Project Biologist and Mitigation Manager will notify the USFWS and/or CDFG immediately in the case of an accidental death or injury to a federal or state-listed species during project-related activities. The Authority or its designee will be notified prior to the notification to the agencies. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above Comment Bio # 3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#22: Implement Conservation Guidelines During the Construction Period for Valley Elderberry Longhorn Beetle. Prior to and during ground-disturbing activities, the Contractor will implement the avoidance and minimization measures. These measures include establishing and maintaining appropriate buffer areas around elderberry plants, surveying for beetle boreholes in affected shrubs, restricting the use of chemicals that might harm beetles, and mowing. After ground-disturbing activities are completed, restore any damage to buffer areas containing elderberry shrubs.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to ground-disturbing activities, during ground-disturbing activities, and after ground-disturbing activities. Follow reporting requirements as	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	In areas where encroachment on the 100-foot buffer has been approved by USFWS, the Contractor will provide a minimum setback of at least 20 feet from the dripline of each Mexican elderberry plant. In buffer areas, ground-disturbing activities should be minimized, and any damaged area should be restored following construction by the Contractor. The Contractor will erect signage every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a federally threatened species, and must not be disturbed. This species is protected by the Federal ESA of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be clearly readable from a distance of 20 feet, and must be maintained by the Contractor for the duration of ground-disturbing activities. To prevent encroachment, these buffer areas must continue to be protected per USFWS protocol (after ground-disturbing activities) from adverse effects of the project during the construction phase. The Contractor will include protective measures such as fencing, signage, weeding, and trash removal to enforce the protection of the valley elderberry longhorn beetle and its associated habitat. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis or at other appropriate intervals.						established by regulatory compliance permits.	
Bio#6: **Construction of the HST alternatives would disturb California tiger salamander habitat.**	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to the Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#9: Mono-Filament Netting. During ground-disturbing activities, the Project Biologist will verify that plastic mono-filament netting (erosion-control matting) or similar material is not used in erosion control materials; substitutes include coconut hair matting or tackified hydroseeding compounds. The Project Biologist will submit memoranda to the Mitigation Manager documenting compliance monthly, or as appropriate, through the life of the project construction.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X			During ground-disturbing activities and Construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio#2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#11: Entrapment Prevention. See description above in Comment Bio#5.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio#5.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio#5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio#3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#15: Restore Temporary Riparian Impacts. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Habitat Mitigation and Monitoring Plan (HMMP) 1600 Streambed Alteration Agreement.
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. See description above in Comment Bio#4.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Plan for monitoring, salvage, relocation, and propagation of special-status plant species and Memorandum documenting compliance
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. See description above in Comment Bio#4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	Condition of Design/Build Contract
	Bio-MM#21: Implement and Monitor Vernal Pool Protection. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post Construction monitoring and reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#23: Translocation of California Tiger Salamanders. Prior to ground-disturbing activities, the Project Biologist or designee will conduct a pre-construction survey and relocate any California tiger salamanders from within the construction footprint in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (USFWS 2003). The relocation will occur for any individuals within the construction footprint per coordination with the USFWS. The Project Biologist will conduct pit trapping. The Contractor's Biologist will work in coordination with the Project Biologist when installing amphibian exclusion fencing specified in Bio-MM#24. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis or at other appropriate intervals.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys. Prior to ground-disturbing activities. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander
	Bio-MM#24: Erect Amphibian Exclusion Fencing. The Contractor's Biologist will install exclusion barriers (i.e. silt fences) to influence the	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist	X	X			Pre-construction. Prior to ground-disturbing	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	movement of California tiger salamander, including other amphibian species, within impacted areas. They can be used to both exclude California tiger salamander, including other amphibian species, from ground-disturbing areas as well as to guide breeding adults toward pre-identified mitigation ponds. Exclusion fencing will be maintained by the Contractor throughout the California tiger salamander's entire active period (November to April) or until all ground-disturbing activities are completed, whichever occurs first. Exclusion fencing must be trenched into the soil at least 4 inches in depth with the soil compacted against both sides of the fence for its entire length to prevent amphibians from passing under the fence. Barriers must be inspected by the Contractor's Biologist at least twice weekly on non-consecutive days and after any significant rain event (defined as a 0.75 inch downpour or 1.5 inches of rain in any 24-hour period). Barriers will be installed by the Contractor with turn-arounds at any access openings needed in the fencing, in order to redirect amphibians away from openings. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Monitoring Party:** Mitigation Manager in coordination with the Authority					activities. Follow reporting as determined by regulatory permit conditions.	
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
Bio#7: Construction of the HST alternatives would disturb western spadefoot toad habitat.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#9: Mono-Filament Netting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X			During ground-disturbing activities and Construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#11: Entrapment Prevention. See description above in Comment Bio #5	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager	X	X			Following incident, immediately report to	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	See description above in Comment Bio#5.	**Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority					USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#15: Restore Temporary Riparian Impacts. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Habitat Mitigation and Monitoring Plan (HMMP) 1600 Streambed Alteration Agreement.
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory compliance permits.	
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	Condition of Design/Build Contract
	Bio-MM#21: Implement and Monitor Vernal Pool Protection. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post Construction monitoring and reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#24: Erect Amphibian Exclusion Fencing. See description above in Comment Bio #6.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys. Prior to ground-disturbing activities. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
								Salamander
	Bio-MM#25: Conduct Emergence and Larval Surveys for Western Spadefoot Toad. The Project Biologist or designee (qualified herpetologist) will conduct pre-construction emergence and larval surveys for western spadefoot toad during the fall and winter rainy season. Emergence surveys will be conducted within the appropriate time period(s) after precipitation events as evaluated by a qualified herpetologist and will be partially in tandem with California tiger salamander surveys. Potential breeding depressions, including vernal pools, will be surveyed for western spadefoot toad larvae concurrently with special-status vernal pool branchiopod and California tiger salamander pre-construction surveys. Adults found within the construction footprint during emergence surveys will be relocated to an appropriate area adjacent to another pool suitable for breeding. Pre-construction surveys will help identify the proper implementation of mitigation measures, identify state and federal permit requirements, and inform the accurate implementation of mitigation requirements. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance after surveys are complete.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys. Prior to ground-disturbing activities. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
Bio#8: Construction of the HST alternatives would disturb habitat that supports the western pond turtle.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
							permit conditions.	Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#9: Mono-Filament Netting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X			During ground-disturbing activities and Construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#15: Restore Temporary Riparian Impacts.	**Implementing Party:** Contractor's Biologist, Project Biologist			X		Post-construction. Follow	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	See description above in Comment Bio #2.	**Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority					reporting requirements as established by agency permit conditions	Habitat Mitigation and Monitoring Plan (HMMP) and Memorandum documenting compliance and other reporting requirements in the 1600 Streambed Alteration Agreement.
	Bio-MM#26: Conduct Western Pond Turtle Pre-Construction Surveys and Relocation. Prior to ground-disturbing activities, conduct pre-construction surveys for western pond turtles to determine the presence or absence of western pond turtles within the construction footprint. If western pond turtles are found within the construction footprint, conduct daily clearance surveys prior to the initiation of any construction activities. If a western pond turtle nest will be affected by ground-disturbing activities, relocate the eggs according to relocation protocol coordinated with CDFG for all life stages of western pond turtles. Relocate hatchling and adult turtles outside of the construction footprint in suitable habitat. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys. Prior to ground-disturbing activities. Clearance surveys during construction. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract
	Bio-MM#27: Conduct Western Pond Turtle Monitoring. During ground-disturbing activities, the Project Biologist will observe all construction activities within habitat that supports populations of western pond turtles. If ESAs are deemed necessary, the Project Biologist will conduct a clearance survey for western pond turtles prior to the time the fence is installed. If necessary, conduct daily clearance surveys prior to construction. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X			During ground-disturbing activities and Daily clearance surveys during construction. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract
	Bio-MM#28: Implement Western Pond Turtle Avoidance and Relocation. Prior to ground-disturbing activities, if a western pond turtle nesting area is present and will be affected by ground-disturbing activities as determined by the Project Biologist, the Contractor will avoid western pond turtle nesting areas. If avoidance is not feasible, as determined by the Authority or its designee, the Project Biologist will coordinate with CDFG to identify where to relocate western pond turtles. The Project Biologist will coordinate specific trapping and relocation protocols with CDFG for adults, hatchlings, and eggs prior to ground-disturbing activities. The Contractor will not move eggs or hatchlings without prior coordination with the Project Biologist and concurrence from CDFG. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis or as determined appropriate pending construction progress.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to ground-disturbing activities and during ground-disturbing activities and construction. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with		X	X		During ground-disturbing activities and Construction Follow reporting as	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
		the Authority					determined by regulatory agency permit conditions.	
Bio#10: Construction of the HST alternatives would disturb nesting Swainson's hawk.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority.	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio # 2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#29: Conduct Pre-Construction Surveys and Monitoring for Raptors. Prior to ground-disturbing activities, the Project Biologist or designee will conduct pre-construction surveys for nesting raptors if construction and habitat removal activities are scheduled to occur during the breeding season (February 1 to August 15). The Project Biologist or designee will conduct surveys in areas within 300 feet of the construction footprint. Modify the required survey dates based on local conditions. If breeding raptors with active nests are found, establish a 300-foot buffer around the nest and phase construction activities within the buffer(s) until the young have fledged from the nest or the nest is abandoned. Approve construction activities within the buffer area, pending site conditions that will not jeopardize the nest. The Project biologist will conduct pre-construction surveys for bald and golden eagle nests within ¼ mile of the construction footprint. If nesting bald or golden eagles are identified, the Contractor's Biologist in coordination with the Project Biologist will establish a 1,000-foot buffer area. The Project Biologist or designee will adjust the 1,000-foot buffer as needed to reflect existing conditions including ambient noise, topography, and disturbance with the approval of the USFWS or CDFG, as appropriate. The Project Biologist or designee will conduct regular monitoring of the nest to determine success/failure and to confirm that project activities are not conducted within the buffer(s) until the nesting cycle is complete or the nest fails. The Project Biologist or designee will document the results of the surveys and the ongoing monitoring, and provide a copy of the monitoring reports for impact areas to the respective agencies. The Project Biologist or designee will approve ground-disturbing activities within the buffer area, pending site conditions that will not jeopardize the nest. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys, prior to ground-disturbing activities, and during construction	Condition of Design/Build Contract
	Bio-MM#31: Raptor Protection on Power Lines. During final design, the Contractor will verify that the catenary system and masts are designed to be raptor-safe, in accordance with *the Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006). The Project Biologist will check the final design drawings and submit a memorandum to the Mitigation Manager documenting compliance	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Final design, completed prior to construction.	Condition of Design/Build Contract
	Bio-MM#32: Conduct Pre-Construction Surveys for Swainson's Hawks. The Project Biologist or designee will conduct pre-construction surveys for Swainson's hawks during the nesting season (March 1 through September 15) within the construction footprint and within a 0.5-mile buffer. The Project Biologist or designee will conduct the pre-construction nest surveys at least 30 days prior to ground-disturbing activities and phase with project construction. The pre-construction surveys will determine the status (i.e., active, inactive) of the nest and then will be used to set up nest avoidance strategies (Bio-	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Pre-construction surveys at least 30 days prior to ground-disturbing activities and construction	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	MM#33). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance with the measure.							
	Bio-MM#33: Swainson's Hawk Nest Avoidance. If active Swainson's hawk nests (defined as a nest used one or more times in the last 5 years) are found within 0.5 mile of the construction footprint during the nesting season (March 1 to September 15), the Contractor's Biologist will implement buffers restricting construction activities, following CDFG's *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California* (CDFG 1994). Adjustments to the buffer(s) will require prior approval by CDFG as coordinated by the Project Biologist. The buffers and nest condition will then be monitored (see Bio-MM#34). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Nesting season (March 1 – September 15)	Condition of Design/Build Contract
	Bio-MM#34: Monitor Removal of Nest Trees for Swainson's Hawks. Prior to ground-disturbing activities, the Project Biologist or designee will monitor nest trees for Swainson's hawks in the construction footprint that are not removed. If a nest tree for a Swainson's hawk must be removed, the Contractor will obtain a Management Authorization (including conditions to offset the loss of the nest tree) from the CDFG, as described in CDFG's Staff Reporting Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California (CDFG 1994). The Management Authorization will specify the tree removal period, generally between October 1 and February 1. If ground-disturbing activities or other project-related activities may cause nest abandonment by a Swainson's hawk or forced fledging within the specified buffer area, monitoring of the nest site (funded by the Authority) by the Project Biologist will be required to determine if the nest is abandoned. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis during the appropriate season.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to ground-disturbing activities, during construction.	Condition of Design/Build Contract
Bio#11: Construction of the HST alternatives would disturb breeding birds, including raptors.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
		the Authority					permit conditions	
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#29: Conduct Pre-Construction Surveys and Monitoring for Raptors. See description above in Comment Bio #10.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys, prior to ground-disturbing activities, and during construction	Condition of Design/Build Contract
	Bio-MM#30: Conduct Pre-Construction Surveys and Delineate Active Nest Exclusion Areas For Other Breeding Birds. In the event active bird nests are encountered during the pre-construction survey, the Project Biologist or designee will determine the nest avoidance buffer zones as appropriate. The Project Biologist or designee will coordinate with the Contractor's Biologist to establish the suitable buffers consistent with the intent of the MBTA and as determined by the Project Biologist. The Project Biologist or designee will delineate nest avoidance buffers established for ground nesting birds in a manner that does not create predatory bird perch points in close proximity (150 feet) to the active nest site. The Project Biological Monitor will monitor active bird nests	**Implementing Party:** Contractor's Biologist, Project Biologist, Project Biological Monitor, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Pre-construction surveys and during construction	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	weekly or more frequently pending status of nest and status of fledgling development. The Contractor's Biologist will maintain the nest avoidance buffer zone until nestlings have fledged or the nest is abandoned. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.							
	Bio-MM#31: Raptor Protection on Power Lines. See description above in Comment Bio #10.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Final design, completed prior to construction.	Condition of Design/Build Contract
Bio#12: Construction of the HST alternatives would disturb or cause the loss of burrowing owls and their habitat.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#35: Conduct Pre-Construction Surveys for Burrowing Owls. Prior to ground-disturbing activities, the Project Biologist or designee will conduct pre-construction surveys in accordance with CDFG's *Staff Report on Burrowing Owl Mitigation* (CDFG 1995). The Project Biologist or designee will conduct these surveys at appropriate timeframes within suitable habitat located in the construction footprint and a 500-foot buffer. Results of the surveys will be used to inform Bio-MM#36. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to ground-disturbing activities, the winter (December 1 through January 31) and breeding season (April 15 through July 15)	Condition of Design/Build Contract
	Bio-MM#36: Burrowing Owl Avoidance and Minimization. Implement burrowing owl avoidance and minimization measures following CDFG's *Staff Report on Burrowing Owl Mitigation* (CDFG 1995). • The Contractor will not disturb occupied burrowing owl burrows during the nesting season (February 1 through August 31) unless it is verified that either the birds have not begun egg-laying and incubation, or that juveniles from the occupied burrows are foraging independently and are capable of independent survival as determined by the Project Biologist or designee. Eviction outside the nesting season may be permitted pending evaluation of eviction plans and receipt of formal written approval from the CDFG authorizing the eviction. • Unless otherwise authorized by CDFG, the Contractor's Biologist will establish a 250-foot buffer (as an environmentally sensitive area) between the construction work area and nesting burrowing owls during the nesting season. The Contractor will maintain this protected area until August 31 or a time set at CDFG's discretion and based upon monitoring evidence, until the young owls are foraging independently. • Unless otherwise authorized by CDFG, the Contractor's Biologist will establish a 160-foot buffer (as an environmentally sensitive area) between the construction work area and occupied burrows during the non-breeding season (September 1 through January 31). The Contractor will maintain this protected area until January 31 or at CDFG's discretion and based upon monitoring evidence, until the young owls are foraging independently. If burrowing owls must be moved away from the construction footprint, the Contractor's Biologist will undertake the passive relocation measures in accordance with CDFG's (1995) guidelines. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance on a weekly basis.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Preconstruction burrow identification, during construction.	Condition of Design/Build Contract
Bio#13: Construction of the HST alternatives would disturb	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written	X	X			Training of all crew/construction personnel prior to start of construction. Provide	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
breeding or nonbreeding bats.		documentation to Authority					weekly/monthly reporting as required by permit conditions.	
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#37: Conduct Pre-Construction Surveys for Special-Status Bat Species. Prior to any ground-disturbing activities, the Project Biological Monitor or designee will conduct a visual and acoustic pre-construction survey	**Implementing Party:** Project Biological Monitor, Project Biologist, Mitigation Manager	X	X	X		Pre-construction surveys, prior to ground-disturbing activities	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	for roosting bats. Include a minimum of one day and one evening in the visual pre-construction survey. The Project Biologist, in coordination with the Mitigation Manager, will contact CDFG if any hibernation roosts or active nurseries are identified within the construction footprint, as appropriate. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority						
	Bio-MM#38: Bat Avoidance and Relocation. During ground-disturbing activities, the Contractor will avoid active hibernation roosts. If avoidance of the hibernation roost is not feasible, the Contractor's Biologist will prepare a relocation plan and coordinate the construction of an alternative bat roost with CDFG. The Contractor will implement the Bat Roost Relocation Plan prior to the commencement of construction activities. Remove roosts with approval from CDFG before hibernation begins (October 31), or after young are flying (July 31), using exclusion and deterrence techniques described in Bio-MM#39 below. The timeline to remove vacated roosts is between August 1 and October 31. All effort to avoid disturbance to maternity roosts will be made during construction activities. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#39: Bat Exclusion and Deterrence. During ground-disturbing activities, if non-breeding or non-hibernating individuals or groups of bats are found within the construction footprint, the bats will be safely excluded by either opening the roosting area to change lighting and airflow conditions, or by installing one-way doors, or other appropriate methods specified by CDFG. The Contractor will leave the roost undisturbed by project-related activities for a minimum of one week after implementing exclusion and/or eviction activities. The Contractor will not implement exclusion measures to evict bats from established maternity roosts or occupied hibernation roosts. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		During ground-disturbing activities	Condition of Design/Build Contract
Bio#14: Construction of the HST alternatives would disturb American badger dens.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with	X	X	X		Prior to construction. Follow reporting requirements as established by agency	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
		the Authority					permit conditions.	implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#11: Entrapment Prevention. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#40: Conduct Pre-Construction Surveys for American Badger. Prior to ground-disturbing activities, the Project Biologist or designee will conduct pre-construction surveys for American badger den sites within suitable habitats in the construction footprint. The Project Biologist will conduct these surveys no more than 30 days before the start of ground-disturbing activities and phase with project build out. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#41: American Badger Avoidance. The Contractor's Biologist will establish a 50-foot buffer around occupied American badger dens. The Contractor will establish a 200-foot buffer around badger maternity dens through the pup-rearing season (February 15 through July 1). Adjustments to the buffer(s) will require prior approval by CDFG as coordinated by the Project Biologist. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction per approval by CDFG	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
Bio#15: Construction of the HST alternatives would disturb San Joaquin kit fox dens.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/Post construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#11: Entrapment Prevention. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#12: Work Stoppage. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist or Project Biological Monitor **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Submit a memorandum to the Mitigation Manager documenting compliance within 1 day of the work stoppage and subsequent action.	Condition of Design/Build Contract
	Bio-MM#13: 'Take' Notification and Reporting. See description above in Comment Bio #5.	**Implementing Party:** Contractor's Biologist, Project Biologist, Mitigation Manager **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Following incident, immediately report to USFWS and/or CDFG. Prepare report and document in weekly/monthly report.	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#42: Conduct Pre-Construction Surveys for San Joaquin Kit Fox. The USFWS' *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 1999b) will be implemented as follows for construction related impacts. Prior to the start of ground-disturbing activities, the Project Biologist or designee will conduct pre-construction surveys in accordance with the USFWS' *San Joaquin Kit Fox Survey Protocol for the Northern Range* (USFWS 1999c). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Pre-construction surveys and prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#43: Minimize Impacts on San Joaquin Kit Fox. The Contractor's Biologist will Implement USFWS' *Standard Measures for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 1999b) to minimize ground disturbance-related impacts on this species. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys and prior to ground-disturbing activities	Condition of Design/Build Contract USFWS' Standard Measures for Protection of the San Joaquin Kit Fox
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Bio#16: Construction of the HST alternatives would temporarily convert special-status plant communities (e.g., Great Valley mixed riparian forest, coastal and valley freshwater marsh, vernal pools).	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency permit conditions.	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field). See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction and Construction	Final construction plans (including grading and landscape plans) and Memorandum regarding the field delineation of all ESAs/ERAs
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Plan for monitoring, salvage, relocation, and propagation of special-status plant species and Memorandum documenting compliance
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
							determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	
	Bio-MM#21: Implement and Monitor Vernal Pool Protection. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post Construction monitoring and reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
Bio#17: Construction of the HST alternatives would have indirect impacts on jurisdictional waters.	**Bio-MM#3: Prepare and Implement a Worker Environmental Awareness Program**. See description above in Comment Bio #3.	**Implementing Party:** Mitigation Manager **Monitoring/Reporting Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Training of all crew/construction personnel prior to start of construction. Provide weekly/monthly reporting as required by permit conditions.	Condition of Design/Build Contract
	Bio-MM#4: Prepare and Implement a Weed Control Plan. See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#5: Prepare and Implement a Biological Resources Management Plan. See description above in Comment Bio #1.	**Implementing Party:** Project Biologist **Monitoring/Reporting Party:** Mitigation Manager to verify completion of the BRMP and provide written documentation to Authority	X				Following implementation and reporting schedule as established by agency permit conditions.	Condition of Design/Build Contract. Biological Resources Management Plan (BRMP) and Construction plans
	Bio-MM#6: Prepare and Implement a Restoration and Revegetation Plan. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction. Follow reporting requirements as established by agency	Condition of Design/Build Contract. Restoration and Revegetation Plan (RRP) for upland communities and Compliance reports to document

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
							permit conditions.	implementation and performance standards
	Bio-MM#7: Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field) See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction and Construction	Memorandum documenting compliance
	Bio-MM#8: Equipment Staging Areas. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract
	Bio-MM#10: Vehicle Traffic. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			During ground-disturbing activities. Report on weekly basis.	Condition of Design/Build Contract
	Bio-MM#15: Restore Temporary Riparian Impacts. See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract Habitat Mitigation and Monitoring Plan (HMMP) and Memorandum documenting compliance and other reporting requirements in the 1600 Streambed Alteration Agreement.
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Plan for monitoring, salvage, relocation, and propagation of special-status plant species and Memorandum documenting compliance
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	Condition of Design/Build Contract
	Bio-MM#21: Implement and Monitor Vernal Pool Protection.	**Implementing Party:** Contractor's Biologist	X	X	X		Prior to construction/Post	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	See description above in Comment Bio #4.	**Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority					Construction monitoring and reporting as determined by regulatory agency permit conditions.	
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
Bio#21: Construction of the HST alternatives would disturb Camp Pashayan (San Joaquin River Ecological Reserve).	**Bio-MM#15: Restore Temporary Riparian Impacts.** See description above in Comment Bio #2.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction. Follow reporting requirements as established by agency permit conditions	Condition of Design/Build Contract Habitat Mitigation and Monitoring Plan (HMMP) and Memorandum documenting compliance and other reporting requirements in the 1600 Streambed Alteration Agreement.
	Bio-MM#17: Conduct Pre-Construction Surveys for Special-Status Plant Species. The Project Biologist will conduct pre-construction surveys for special-status plant species in suitable habitat areas, subject to ground-disturbing activities. The surveys will be conducted in the appropriate season prior to ground-disturbing activities for salvage and relocation activities. The Project Biologist will use the results of the Special-Status Plants Survey Report (prepared as part of the Biological Resources Technical Report), including mapping of locations of special-status plant species, to determine focused locations for the pre-construction surveys, as appropriate. The Project Biologist will work with the Contractor's Biologist to mark and avoid locations of all special-status plant species observed where feasible or incorporate the species into the relocation/compensation program defined in Bio-MM#50: Compensate for Impacts on Special-Status Plant Species. Prior to ground-disturbing activities, the Contractor will protect any populations of special-status plant species identified during the surveys within 100 feet of the construction footprint as ERAs. As appropriate, the Contractor's Biologist will update the special-status or habitats of concern mapping within the construction limits, based upon resource agency permits. The Contractor's Biologist will determine the locations of special-status plant species on construction drawings and identified as ESAs within the construction footprint. Plant populations within 100 feet of the construction limits will be fenced as ERAs by the Contractor's Biologist. Terms and conditions from	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Pre-construction and Prior to ground-disturbing activities	Plan for monitoring, salvage, relocation, and propagation of special-status plant species and Memorandum documenting compliance

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Section 7 and Section 2081 agreements will be incorporated as appropriate. The Project Biologist will provide verification and report through memorandum to the Mitigation Manager.							
	Bio-MM#18: Prepare and Implement Plan for Salvage, Relocation and/or Propagation of Special-Status Plant Species. See description above in Comment Bio #3.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X		X		Pre-construction and prior to ground-disturbing activities. Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract
	Bio-MM#19: Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to ground-disturbing activities Follow reporting requirements as established by regulatory compliance permits.	Condition of Design/Build Contract Plan for monitoring, salvage, relocation, and propagation of special-status plant species and Memorandum documenting compliance
	Bio-MM#20: Seasonal Vernal Pool Work Restriction. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction. Seasonal restrictions: October 15 to June 1 (corresponding to the rainy season), or as determined through informal or formal consultation with the USFWS or USACE. Report within 1 month of completing the field work	Condition of Design/Build Contract
	Bio-MM#21: Implement and Monitor Vernal Pool Protection. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post Construction monitoring and reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#44: Restore Temporary Impacts on Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		Construction and Post-construction Follow reporting as determined by regulatory agency permit conditions.	Condition of Design/Build Contract
	Bio-MM#45: Monitor Construction Activities within Jurisdictional Waters. See description above in Comment Bio #4.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority		X	X		During ground-disturbing activities and Construction Follow reporting as determined by regulatory	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
							agency permit conditions.	
	PK-MM#4: Acquire Park Property for Camp Pashayan. Final design will continue to seek to minimize right-of-way impacts and pier placement in Camp Pashayan. Mitigation will include in-lieu fee for property impacts associated with pier installation as well as revegetation of disturbed areas with native plantings (consistent with CDFG vegetation/landscaping plans for the reserve).	**Implementing Party:** Contractor's Biologist and Authority **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X				Prior to construction/monthly reporting	The Authority will work with the California Department of Fish and Game to prepare and execute an agreement to acquire the property.
Bio#22: Project period impacts from the HST would permanently convert Great Valley mixed riparian forest and other riparian habitat (Coastal and Valley Freshwater Marsh and vernal pools addressed in Bio-IMPACT#16).	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. The Authority will compensate for permanent impacts on Great Valley mixed riparian forest and other riparian habitats, determined in consultation with the appropriate agencies (e.g., CDFG), by restoring nearby areas to suitable habitat through permittee-responsible mitigation and/or by purchasing credits in a mitigation bank. Other relevant regulatory permits addressing riparian impacts include the CDFG 1600 Streambed Alteration Agreement, the USACE Section 404 Permit, and the SWRCB 401 Permit. The HMMP will provide the planning details as referenced in Bio-MM#58. Bio-MM#56 provides documentation and reporting requirements. Compensation will be based on the following ratios (acres of mitigation to acres of impact): • Great Valley Mixed Riparian Forest: 2:1 • Other Riparian: 2:1	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. The Authority or its designee, prior to final design, will conduct a jurisdictional delineation, documenting jurisdictional waters and state streambeds consistent with USACE, SWRCB, and CDFG guidance. As part of the delineation, determine the functions and values of the jurisdictional waters using accepted methods such as the CRAM so that the functions and values have been replaced and that no net loss of jurisdictional waters and state streambed values occurs. Develop habitat replacement guidelines to identify and quantify habitats that are to be removed and identify the locations for restoring or relocating habitats. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. As part of the USFWS, USACE, SWRCB, and CDFG permit applications and prior to ground-disturbing activities, the Authority or its designee will prepare an HMMP to mitigate for temporary and permanent impacts on jurisdictional waters and state streambeds. The HMMP will detail performance standards, including percent cover of native species, survivability, canopy cover requirements, wildlife utilization, the acreage basis, restoration ratios, and the combination of onsite and/or offsite mitigation. Preference shall be given to conduct the mitigation within the same watershed where the impact occurs. The Authority or its designee will conduct work with the USACE, SWQCB, and CDFG to develop appropriate avoidance, minimization, mitigation, and monitoring measures to be incorporated into the HMMP. The intent of the HMMP is to mitigate for the lost functions and values of impacts on jurisdictional waters and state streambeds consistent with resource agency requirements and conditions presented in Sections 404 and 401 of the CWA and Section 1600 of the CFGC. It is also anticipated that since listed species such as California tiger salamander, colusa grass, and vernal pool branchiopods are nested within these habitats, the HMMP will also serve to mitigate for listed species through Section 7 of ESA and CESA 2081. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance. In the HMMP, the applicant or its designee shall incorporate the following standard requirements consistent with USACE, SWRCB, and CDFG guidelines: • Description of the project impact/site. • Goal(s) (i.e., functions and values) of the compensatory mitigation project. • Description of the proposed compensatory mitigation site. • Implementation plan for the proposed compensatory mitigation site. • Maintenance activities during the monitoring period. • Monitoring plan for the compensatory mitigation site. • Completion of compensatory mitigation. • Contingency measures. Additionally, the following will be included at a minimum for the implementation plan: • Site analysis for appropriate soils and hydrology. • Site preparation specifications based on site analysis, including but not limited to grading and weeding. • Soil and plant material salvage from impact areas, as appropriate to the timing of impact and restoration as well as the location of restoration sites. • Specifications for plant and seed material appropriate to the locality of the mitigation site. • Specifications for site maintenance to establish the habitats, including but not limited to weeding and temporary irrigation.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Habitat restoration, enhancement, and/or establishment activities will be conducted on some of the compensatory (i.e., selected permittee-responsible) mitigation sites to achieve the mitigation goals. A detailed design of the mitigation habitats will be created in coordination with the permitting agencies and be described in the HMMP. It is recognized that several HMMPs will be developed consistent with the selected mitigation sites and the resources mitigated at each. The primary engineering and construction contractors will ensure, through coordination with the Project Biologist, that construction is implemented in a manner that minimizes disturbance of such areas to the extent feasible. Temporary fencing will be used during construction to avoid sensitive biological resources that are adjacent to construction areas and can be avoided. Performance standards are targets for determining the effectiveness of the mitigation and assessing the need for adaptive management (e.g., mitigation design or maintenance revisions). Success criteria are formal criteria that must be met after a specific timeframe to meet regulatory requirements of the permitting agencies. Where applicable, replacement planting/seeding will be implemented if monitoring demonstrates that performance goals or success criteria are not met during a particular monitoring interval. The criteria for measuring performance will be used to determine whether the habitat improvement is trending toward sustainability (i.e., reduced human intervention) and to assess the need for adaptive management. These criteria must be met for the habitat improvement to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria will be developed in consultation with the permitting agencies. The criteria include: • Percent survival of planted trees (65–85%). • Percent survival of transplanted trees (60–85%). • Percent relative canopy cover (5–35%). • Percent cover of invasive species (<1%). • Percent cover of nonnative herbaceous plants (<10–25%). • Percent absolute cover of native species (>50–80%). • Percent relative cover of native species (>50%). • Percent total cover of plant species (20–75%). • Percent relative cover of wetland indicator species (75–90%). • Water level within +/-6 inches (or other measurement) of design. • Species composition and community diversity, relative to reference sites, and/or as described in the guidelines issued by permitting agencies (e.g., USFWS conservation guidelines for valley elderberry longhorn beetle). Performance goals and success criteria will be provided for each of the years of monitoring and will be specific to habitat types at each permittee-responsible mitigation site. The monitoring schedule will be detailed in the site-specific HMMPs. To be deemed successful, the site may be required to meet the success							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	criteria only in selected years. However, if success criteria are not met in specific years, remedial measures, including regrading, adjustment to modify the hydrological regime, and/or replacement planting or seeding, must be implemented and that year's monitoring must be repeated the following year until the success criteria are met. The success criteria specified must be reached without human intervention (e.g., irrigation, replacement plantings) aside from maintenance practices described in the site-specific HMMPs for maintenance during the establishment period. Where the HST alignment affects an existing mitigation bank, the Authority or its designee will modify the mitigation ratio to meet the vernal pool mitigation requirement. The Authority or its designee will relocate the affected portion of the mitigation bank or compensate the landowner in accordance with the Uniform Relocation and Real Property Policy Act of 1970, as amended. The Project Biologist will oversee the implementation of all HMMP elements and monitor consistent with the prescribed maintenance and performance monitoring requirements. The Project Biologist will prepare annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits. In addition, the Project Biologist will document compliance and submit to the Mitigation Manager.							
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. The Authority or its designee will mitigate permanent wetland impacts through compensation determined in consultation with the USACE, SWRCB, USFWS, and CDFG, in order to be consistent with the HMMP (Bio-MM#56). Regulatory compliance for jurisdictional waters includes relevant terms and conditions from the USACE 404 Permit, SWRCB 401 Permit, and CDFG 1600 Streambed Alteration Agreement. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance. Performance standards for jurisdictional waters are generally described in Bio-MM#56. It is important to recognize that Bio-MM#56 includes standards that apply to several resource areas (e.g., jurisdictional waters, riparian habitat, California tiger salamander habitat). Compensation could include one of the following: • Purchase of credits from an agency-approved mitigation bank. • Fee-title-acquisition of natural resource agency-related property. • Purchase or establishment of a conservation easement with an endowment for long-term management of the property-specific conservation values. • In-lieu fee contribution determined through negotiation and consultation with the various natural resource regulatory agencies. Base compensation for permanent impacts on the following ratios (acres of mitigation to acres of impact), pending agency confirmation: • Vernal pools and other seasonal wetlands: 2:1 Preservation and 1:1 Creation.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	• Coastal and Valley Freshwater Marsh: 1:1. • Other Wetlands: Between 1.1:1 and 1.5:1 (1:1 onsite and 0.1 to 0.5:1 offsite), based on function and values lost. • Ratios determined in consultation with the appropriate agencies.							
	Bio-MM#60: Offsite Habitat Restoration, Enhancement, and Preservation. Prior to site preparation at the mitigation site, the Authority or its designee will consider the offsite habitat restoration, enhancement, or preservation program, and identify short-term temporary and/or long-term permanent effects on the natural landscape. A determination will be made on any effects from the physical alteration of the site to onsite biological resources, including plant communities, land cover types, and the distribution of special-status plants and wildlife. Appropriate seasonal restrictions (e.g., breeding season) may be applicable if appropriate habitats exist onsite. Activities resulting in the physical alteration of the site include grading/modifications to onsite topography, stockpiling, storage of equipment, installation of temporary irrigation, removal of invasive species, and drainage feature treatments. In general, the long-term improvements to habitat functions and values will offset temporary effects during restoration, enhancement, or preservation activities. The offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite. Potential effects on site-specific hydrology and the downstream resources will be evaluated as a result of implementation of the restoration-related activity. Site-specific BMPs and an SWPPP will be implemented as appropriate. The Authority or its designee will report on compliance with permitting requirements. The Project Biologist will be responsible for the monitoring and tracking of the program and will prepare a memorandum of compliance and submit to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#23: Project period impacts from the HST alternatives would permanently convert suitable habitat that has potential to support special-status plant species.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager to verify completion of this measure and provide written documentation to Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#50: Compensate for Impacts on Special-Status Plant Species. Prior to Final Design and during the permitting process, the Authority will comply with CESA and the federal ESA by implementing the following	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist	X	X	X		Prior to final design	Memorandum documenting compliance

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	measures: Purchase credits from an existing mitigation bank or conduct a special-status plant re-establishment program within the same watershed or in proximity to the impact area at a 1:1 ratio. The success of the special status plant species program is related to the success of the vernal pools. Restored areas must be similar in species composition and ecosystem function to the reference habitat to be considered completed and successful at the end of the monitoring period. In general, this means that data collected on restored or enhanced pools must fall within the range of data obtained from reference pools. General performance standards and guidelines are presented in Bio-MM#58. Mitigate the impacts on special-status plants in accordance with the USFWS Biological Opinion and/or CDFG 2081(b). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Monitoring Party:** Mitigation Manager in coordination with the Authority						
	Bio-MM#51: Implement Conservation Guidelines During the Project Period for Valley Elderberry Longhorn Beetle. The Authority or its designee will conduct compensatory mitigation for the valley elderberry longhorn beetle, including transplantation and replacement of elderberry shrubs, and maintenance for replacement shrubs, following the USFWS' *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999a). Performance standards for valley elderberry longhorn beetle habitat are generally described in Bio-MM#58. It is important to recognize that Bio-MM#58 includes standards that apply to several resource areas (e.g., jurisdictional waters, riparian habitat, California tiger salamander habitat).The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to Operations	Memorandum documenting compliance
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#24: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support vernal pool branchiopods.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
		the Authority						consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#25: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support valley elderberry longhorn beetle.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#51: Implement Conservation Guidelines During the Project Period for Valley Elderberry Longhorn Beetle. See description above in Comment Bio #23.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X			Memorandum documenting compliance
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#26: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support California	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with			X		Post-construction	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
tiger salamander.		the Authority						
	Bio-MM#52: Compensate for Impacts on California Tiger Salamander. The Authority or its designee will determine compensatory mitigation for the temporary and permanent loss of suitable upland and aquatic breeding habitat through agency consultation with the USFWS and CDFG. Compensatory mitigation could include one of the following: • Purchase of credits from an agency-approved mitigation bank. • Fee-title-acquisition of natural resource regulatory agency-approved property. • Purchase or establishment of a conservation easement with an endowment for long-term management of the property-specific conservation values. • In-lieu fee contribution determined through negotiation and consultation with the various natural resource regulatory agencies. • Implementation of USFWS Biological Opinion and/or CDFG 2081(b). The Project Biologist will submit a memorandum documenting compliance to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Memorandum documenting compliance with agency-issued BO and 2081 Determination.
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule / Reporting Schedule	Implementation Mechanism or Tool
								their jurisdiction and resources onsite
Bio#27: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support western spadefoot toad.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/ monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Memorandum documenting compliance
	Bio-MM#25: Conduct Emergence and Larval Surveys for Western Spadefoot Toad. The Project Biologist or designee (qualified herpetologist) will conduct pre-construction emergence and larval surveys for western spadefoot toad during the fall and winter rainy season. Emergence surveys will be conducted within the appropriate time period(s) after precipitation events as evaluated by a qualified herpetologist and will be partially in tandem with California tiger salamander surveys. Potential breeding depressions, including vernal pools, will be surveyed for western spadefoot toad larvae concurrently with special-status vernal pool branchiopod and California tiger salamander pre-construction surveys. Adults found within the construction footprint during emergence surveys will be relocated to an appropriate area adjacent to another pool suitable for breeding. Pre-construction surveys will help identify the proper implementation of mitigation measures, identify state and federal permit requirements, and inform the accurate implementation of mitigation requirements. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance after surveys are complete.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction surveys. Prior to ground-disturbing activities. Follow reporting as determined by regulatory permit conditions.	Condition of Design/Build Contract
	Bio-MM#52: Compensate for Impacts on California Tiger Salamander. See description above in Comment Bio #26.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Memorandum documenting compliance with agency-issued B) and 2081 Determination.
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource	Documentation Reports demonstrating compliance with HMMP

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
							agency permits.	
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#28: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support western pond turtle.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#53: Implement Western Pond Turtle Mitigation Measures. The Authority or its designee will mitigate the impacts on western pond turtle in accordance with the USFWS Biological Opinion and/or CDFG 2081(b). The Project Biologist will submit a memorandum documenting compliance to the Mitigation Manager.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X			Memorandum documenting compliance with BO and 2081 Determination
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#30: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support nesting Swainson's hawk.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#54: Compensate for Loss of Swainson's Hawk Foraging Habitat. • To compensate for the loss of Swainson's hawk foraging habitat, the Authority or its designee will provide compensatory mitigation that follows the ratios recommended by CDFG's (1994) Staff Report Regarding Mitigation	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to operation	Memorandum documenting compliance

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	for Impacts to Swainson's hawks in the Central Valley. The Project Biologist will submit a memorandum documenting compliance to the Mitigation Manager. The ratios are based on the distance from the construction footprint to the closest active nest site (which for this species is defined as a nest used one or more times in the last 5 years), as follows: • Compensate where impacts on foraging habitat occur within 1 mile of an active nest tree, at a 1:1 ratio on agricultural lands or other suitable foraging habitat; or at a 0.5:1 ratio where habitat can be managed for prey production. • Compensate where impacts on foraging habitat occur within 5 miles, but more than 1 mile from an active nest tree, at a 0.75:1 ratio. • Compensate where impacts on foraging habitat occur within 10 miles, but more than 5 miles from an active nest tree, at a 0.5:1 ratio. Mitigate the impacts on special-status plants in accordance with the USFWS Biological Opinion and/or CDFG 2081(b).							
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Bio#31: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support burrowing owls.	**Bio-MM#14: Post-Construction Compliance Reports.** See description above. in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Memorandum documenting compliance
	Bio-MM#55: Compensate for Loss of Burrowing Owl Foraging and Breeding Habitat. The Authority or its designee will provide base compensatory mitigation for the temporary and permanent loss of foraging and breeding habitat on the number of western burrowing owl pairs or individuals affected. Compensation will be at a 6.5:1 ratio (acres of habitat: number of pairs or individuals). Mitigate each occupied burrow destroyed by enlarging or enhancing existing unsuitable burrows at a 2:1 ratio based on CDFG's (1995) *Staff Report on Burrowing Owl Mitigation*. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Memorandum documenting compliance with CDFG guidance
Bio#32: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support breeding birds, including raptors and burrowing owls.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#54: Compensate for Loss of Swainson's Hawk Foraging Habitat. See description above in Comment Bio #30.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Memorandum documenting compliance
	Bio-MM#55: Compensate for Loss of Burrowing Owl Foraging and Breeding Habitat. The Authority or its designee will provide base compensatory mitigation for the temporary and permanent loss of foraging and breeding habitat on the number of western burrowing owl pairs or individuals affected. Compensation will be at a 6.5:1 ratio (acres of habitat: number of pairs or individuals). Mitigate each occupied burrow destroyed by enlarging or enhancing existing unsuitable burrows at a 2:1 ratio based on CDFG's (1995) *Staff Report on Burrowing Owl Mitigation*. The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Memorandum documenting compliance with CDFG guidance

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#33: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status bats.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/ monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	HMMP
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#34: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support American badger dens.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Memorandum documenting compliance
	Bio-MM#47: Install Wildlife Fencing Prior to operation of the HST, the Contractor's Biologist will install free-ranging mammal-proof fencing along portions of the proposed project consistent with final design. The Project Biologist will verify that the installation is consistent with the designated terms and conditions in the applicable permits. The Project Biologist will prepare and	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Post-construction	Memorandum documenting compliance

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	submit a memorandum to the Mitigation Manager documenting compliance.							
	Bio-MM#48: Construction in Wildlife Movement Corridors. Before ground-disturbing activities, the Contractor's Biologist will submit a construction avoidance and minimization plan for the Eastman Lake-Bear Creek ECA to the Project Biologist for concurrence. During ground-disturbing activities, the Contractor will keep the Eastman Lake-Bear Creek ECA riparian corridors (including Deadman and Dutchman creeks) free of all equipment, storage materials, construction materials, and any significant potential impediments. The Contractor will minimize ground-disturbing activities within the Eastman Lake-Bear Creek ECA riparian corridors (Deadman and Dutchman creeks) during nighttime hours to the extent practicable. In addition, keep nighttime illumination (e.g., for security) from spilling into the ECA or shield nighttime lighting to avoid illumination spilling into the ECA. Inspections will verify compliance and the Project Biologist will report through an appropriate memorandum to the Mitigation Manager.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Post-construction	Memorandum documenting compliance
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Bio#35: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support San Joaquin kit fox dens.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#47: Install Wildlife Fencing. See description above in Comment Bio #34.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#48: Construction in Wildlife Movement Corridors. See description above in Comment Bio #34.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Pre-construction and during construction	Condition of Design/Build Contract
	Bio-MM#56: Compensate for Destruction of Natal Dens. The Authority or its designee will mitigate the destruction of kit fox natal dens by the purchase of suitable, approved habitat (USFWS and CDFG). Replace habitat at a minimum of 1:1 acre of habitat in order to provide additional protection and habitat in a location consistent with the recovery of the species. Mitigate the impacts on San Joaquin kit fox in accordance with the USFWS Biological Opinion and/or CDFG 2081(b). The Project Biologist will submit a memorandum to the Mitigation Manager documenting compliance.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Memorandum documenting compliance with BO and 2081 Determination
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource agency permits.	Documentation Reports demonstrating compliance with HMMP
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with	X	X	X		Prior to Operation	Documentation of compliance with permit conditions

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
		the Authority						
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#36: Project period impacts from the HST alternatives would permanently convert special-status plant communities (Great Valley Mixed Riparian and other riparian addressed in Bio#22).	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#51: Implement Conservation Guidelines During the Project Period for Valley Elderberry Longhorn Beetle. See description above in Comment Bio #23.	**Implementing Party:** Contractor's Biologist in coordination with the Authority **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		During construction	Memorandum documenting compliance
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource	Documentation Reports demonstrating compliance with HMMP

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
							agency permits.	
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#37: Project period impacts from the HST alternatives would permanently convert jurisdictional waters.	**Bio-MM#4: Prepare and Implement a Weed Control Plan.** See description above in Comment Bio #1.	**Implementing Party:** Contractor's Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X			Prior to construction/monthly memorandum to document the progress of the Weed Control Plan and implementation	Condition of Design/Build Contract
	Bio-MM#14: Post-Construction Compliance Reports. See description above in Comment Bio #3.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Post-construction	Condition of Design/Build Contract
	Bio-MM#49: Compensate for Permanent Riparian Impacts. See description above in Comment Bio #22.	**Implementing Party:** Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority			X		Prior to operation	Post-construction compliance reports consistent with the appropriate agency-issued permits
	Bio-MM#57: Conduct Delineation of Jurisdictional Waters and State Streambeds. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X				Prior to ground-disturbing activities	Condition of Design/Build Contract
	Bio-MM#58: Prepare and Implement a Habitat Mitigation and Monitoring Plan. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X	X	Annual monitoring reports for 5 years (or less if success criteria are met as described earlier) and/or other documentation prescribed in the resource	Documentation Reports demonstrating compliance with HMMP

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
							agency permits.	
	Bio-MM#59: Compensate for Permanent Impacts on Jurisdictional Waters. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to Operation	Documentation of compliance with permit conditions
	Bio-MM#60: Offsite Habitat Restoration, Enhancement and Preservation. See description above in Comment Bio #22.	**Implementing Party:** Contractor's Biologist, Project Biologist **Reporting Party:** Project Biologist **Monitoring Party:** Mitigation Manager in coordination with the Authority	X	X	X		Pre-Construction, Construction, Post-Construction	Offsite habitat restoration, enhancement, and preservation program will be designed, implemented, and monitored consistent with the terms and conditions of the USACE Section 404 Permit, CDFG 1600 Streambed Alteration Agreement, and CESA and federal ESA as they apply to their jurisdiction and resources onsite
Bio#40: All of the HST alternatives would affect Camp Pashayan (within the San Joaquin River Ecological Reserve).	**PK-MM#1: Compensate for Staging in Park Property for Construction**. See description below in Impact PK #4.	**Implementing Party:** Contractor's Biologist **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post construction. Authority to coordinate with local jurisdictions.	The Authority and contractor will work with respective jurisdictions to develop a staging plan.
	PK-MM#4: Acquire Park Property for Camp Pashayan. Final design will continue to seek to minimize right-of-way impacts and pier placement in Camp Pashayan. Mitigation will include in-lieu fee for property impacts associated with pier installation as well as revegetation of disturbed areas with native plantings (consistent with CDFG vegetation/landscaping plans for the reserve).	**Implementing Party:** Contractor's Biologist and Authority **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X				Prior to construction/monthly reporting	The Authority will work with the California Department of Fish and Game to prepare and execute an agreement to acquire the property.
NMFS Biological Opinion Measures								
NMFS#1 Bridge Construction would negatively impact special status anadromous fish populations and their migration(s)	**NMFS-MM#1: Conduct Pre Construction Snorkel Surveys**. Pre-construction fish surveys (snorkel surveys following CDFG Salmonid Restoration Manual techniques) will be conducted by qualified fisheries biologist to determine the presence and density of salmonids utilizing the Resource Study Area (RSA). During construction a qualified fisheries biologist with experience in snorkel surveys and salmonid identification will be conducting fish presence surveys immediately prior to any in-water work (e.g. installation of temporary sheet piles to isolate work area) and surveys will be conducted again if there is a multi-day pause or lapse in construction activities.	**Implementing Party:** Contractor's Biologist **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X				Prior to bridge construction or ground disturbing activities affecting the buffer area under the jurisdiction of NMFS	Condition of Design/Build Contract and Condition of NMFS Biological Opinion

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
NMFS#2 Dewatering of the San Joaquin River will cause mortality to fish stocks, including special status anadromous fish	**NMFS-MM#2 Prepare a Fish Rescue Plan**. Implement Fish Rescue Plan to minimize fish stranding and mortality inside the cofferdam that will be dewatered for bridge construction. The contractor's fishery will develop and implement a fish rescue plan acceptable to the CDFG, USFWS, and NMFS.	**Implementing Party:** Contractor's Biologist **Monitoring/Reporting Party:** Mitigation Manager in coordination with Authority	X				Prior to bridge construction or ground disturbing activities affecting the buffer area under the jurisdiction of NMFS	Condition of Design/Build Contract and Condition of NMFS Biological Opinion
	NMFS-MM#3: Conduct Fish Relocation and Monitoring During and After Dewatering. The contractor will ensure that a qualified fisheries biologist with a current CDFG collection permit conducts the fish rescue and relocation efforts behind the cofferdam. The fish rescue effort will be implemented during the dewatering of the areas behind the cofferdam(s) and involve capture and return of those fish to suitable habitat within the adjacent waterways. The area will first be seined, followed by electrofishing to remove fish that are behind the cofferdam. A fisheries biologist will be on-site during initial pumping (dewatering) to ensure compliance with the plan.	**Monitoring/Implementing Party:** Contractor's Biologist and Authority	X	X			During bridge construction	**NMFS-MM#3: Conduct Fish Relocation and Monitoring During and After Dewatering.** The contractor will ensure that a qualified fisheries biologist with a current CDFG collection permit conducts the fish rescue and relocation efforts behind the cofferdam. The fish rescue effort will be implemented during the dewatering of the areas behind the cofferdam(s) and involve capture and return of those fish to suitable habitat within the adjacent waterways. The area will first be seined, followed by electrofishing to remove fish that are behind the cofferdam. A fisheries biologist will be on-site during initial pumping (dewatering) to ensure compliance with the plan.
Hydrology and Water Resources								
No significant impacts on hydrology and water resources have been identified.								
Geology, Soils, and Seismicity								
With implementation of standard engineering design measures and BMPs, impacts for elevated structures, retained cuts, retained fills, and at-grade segments of each alternative would be less than significant. Therefore, mitigation measures are not required.								
Hazardous Materials and Wastes								
HMW#1: Handling of Extremely Hazardous Materials within 0.25 mile of a School	**HMW-MM#1: Limit use of extremely hazardous materials near schools.** The contractor shall not handle an extremely hazardous substance (as defined in California Public Resources Code Section 21151.4) or a mixture containing extremely hazardous substances in a quantity equal to or greater than the state threshold quantity specified pursuant to subdivision (j) of Section 25532 of the Health and Safety Code within 0.25 mile of a school. Signage would be used to delimit all work areas within 0.25 mile of a school and the contractor would be required to monitor all use of extremely hazardous substances.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to verify compliance during construction.		X			Construction/Monthly reporting	Contract Requirements/Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Station Planning, Land Use, and Development								
No impacts on land use have been identified that would be significant under NEPA. All three alternatives and the HMF sites are consistent with local and regional land use plans, policies, and regulations adopted for the purpose of avoiding or mitigating an environmental effect. The alternatives and the HMF sites would not cause significant changes in land use patterns or intensities that would be incompatible with adjacent land uses. Station effects related to increased density and TOD are considered beneficial and would result in infill development and redevelopment of the downtown centers, which would reduce pressures on the surrounding agricultural lands.								
Agricultural Lands								
Ag#1: Permanent Conversion of Agricultural Land to Nonagricultural Use.	**Ag-MM#1: Preserve the Total Amount of Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Unique Farmland.** The Authority will enter into an agreement with the DOC California Farmland Conservancy Program to implement the preservation of farmland. The Authority will fund the California Farmland Conservancy Program's work to identify suitable agricultural land for mitigation of impacts and to fund the purchase of agricultural conservation easements from willing sellers. The performance standards for this measure are to preserve Important Farmland in an amount commensurate with the quantity and quality of the converted farmlands, within the same agricultural regions as the impacts occur, at a replacement ratio of not less than 1:1. The California Farmland Conservancy Program will work with local, regional, or statewide entities whose purpose includes the acquisition and stewardship of agricultural conservation easements. The Authority and California Farmland Conservancy Program will develop selection criteria under this agreement to guide the pursuit and purchase of conservation easements. These will include, but are not limited to, provisions to ensure that the easements will conform to the requirements of Public Resources Code Section 10252 and to prioritize the acquisition of willing seller easements on lands that are adjacent to other protected agricultural lands or that would support the establishment of greenbelts and urban separators. This mitigation measure would be effective given the nationwide and local success of farmland preservation programs using agricultural conservation easements and the experience of the DOC California Farmland Conservancy program. However, because the mitigation does not anticipate the creation of new farmland (conversion of natural lands to agriculture), the Authority and FRA are not claiming that the mitigation measure would reduce impacts to a less than significant level.	**Implementing Party:** Authority & California Farmland Conservancy **Monitoring/Reporting Party:** Authority	X				Prior to construction/Monthly reporting Prior to construction	The Authority will enter into an agreement with the DOC California Farmland Conservancy Program to implement the preservation of farmland. The Authority and California Farmland Conservancy Program will develop selection criteria under this agreement to guide the pursuit and purchase of conservation easements.
Electromagnetic Fields and Electromagnetic Interference								
The project would comply with applicable federal and state regulations and implement design strategies as outlined in the Final Statewide Program EIR/EIS (Authority and FRA 2005). No significant impacts would occur during construction nor operation of the Project Alternatives or HMFs.								
Parks, Recreation, and Open Space								
PK#4: Camp Pashayan (City of Fresno) Construction Impacts	**PK-MM#1: Compensate for Staging in Park Property for Construction.** The Authority will coordinate with the respective jurisdictions to establish appropriate compensation in terms of allowance or additional property to accommodate for displaced park use during construction. This will includes screening stockpiled material and construction excavations through the use of	**Implementing Party:** Contractor's Biologist **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X	X	X		Prior to construction/Post construction. Authority to coordinate with local jurisdictions.	The Authority and contractor will work with respective jurisdictions to develop a staging plan.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	temporary construction barriers and other screens, where they are exposed to park users; and restoring affected portions of the property after construction and use native plant materials for revegetation where appropriate. The temporary impacts will be restored in place, to its natural state before construction. This restoration plan will be developed and described in the work plan prepared by the contractor and approved by CDFG. The construction would be coordinated activities to avoid scheduled weekend activities, when appropriate. For example, existing access entry points to Camp Pashayan will remain open during construction, since project construction would occur along the southern boundary of the property and vehicle/bicycle/pedestrian access entry points are well north of the construction zone; visitors would continue to be able to access Camp Pashayan as they do currently. Only the southern end of Camp Pashayan in the construction zone would be access-restricted during construction.If any additional CDFG management and maintenance resources are needed to accommodate the work, such as use of public restrooms, or on-site assistance, there will be compensation for those resources. Construction activities would be coordinated with the CDFG to plan for using the area under the elevated tracks as available Ecological Reserve land, contingent upon consistency with the Authority's policy on air-rights with restrictions related to HST operations and maintenance, as well as approval/acceptance by FRA Office of Safety and the Department of Homeland Security.							
PK#7: Camp Pashayan Park. At Camp Pashayan, 0.6 acre of park area would be acquired for support columns and easement for elevated structure.	**PK-MM#4: Acquire Park Property for Camp Pashayan.** Final design will continue to seek to minimize right-of-way impacts and pier placement in Camp Pashayan. Mitigation will fully compensate for the permanent loss of any land, whether by way of acquisition of available sites along the San Joaquin River, or other comparable mitigation and include the revegetation of disturbed areas with native plantings (consistent with CDFG vegetation/landscaping plans for the reserve).	**Implementing Party:** Contractor's Biologist and Authority **Monitoring/Reporting Party:** Mitigation Manager in coordination with the Authority	X				Prior to construction/monthly reporting	The Authority will work with the California Department of Fish and Game to prepare and execute an agreement to acquire the property.
PK#8: Roeding Park (City of Fresno) Noise Impacts on the eastern portions of the park	**PK-MM#5: Address Noise at Roeding Park with City of Fresno.** To mitigate the noise impacts, a sound barrier approximately 2,800 feet in length will be constructed. It is assumed that a sound barrier will be 10 to 14 feet tall and have aesthetic treatment. A 10-foot-high sound barrier will reduce noise to 64 dBA at 250 feet inside the park and residual noise effects will occur. A 14-foot-high sound barrier will reduce noise effects to within 1 dB of no impact. Aesthetic treatment of the sound barrier will be selected with input from the community.	**Implementing Party:** Contractor to identify sound barriers in construction plans. **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with this measure.	X				Design and Construction	The Authority will work with the City of Fresno as the resource owner to address noise impacts. It is possible that the City of Fresno would view the projected noise levels as acceptable and preferable to the implementation of mitigation measures.
Aesthetics and Visual Resources								
During final design of elevated guideways	**VQ-MM#3: Incorporate Design Criteria for Elevated and Station Elements That Can Adapt to Local Context.** During final design of elevated	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to	X				Final design and Construction/Monthly	Established local consultation process with City of Merced and

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
and the Merced and Fresno stations, the Authority will coordinate with local jurisdictions on the design of these facilities so that they are designed appropriately to fit in with the visual context of the areas near them.	guideways and the Merced and Fresno stations, the Authority will coordinate with local jurisdictions on the design of these facilities so that they are designed appropriately to fit in with the visual context of the areas near them. This will include the following activities: • For stations: During the station design process, establish a local consultation process with the City of Merced and the City of Fresno to identify and integrate local design features into the station design through a collaborative context-sensitive solutions approach. The process will include activities to solicit community input in their respective station areas. This effort will be coordinated with the station area planning process that will be undertaken by those cities under their station area planning grants. • For elevated guideways in cities or unincorporated communities: During the elevated guideway design process, establish a process with the city or county with jurisdiction over the land along the elevated guideway to advance the final design through a collaborative context-sensitive solutions approach. Participants in the consultation process will meet on a regular basis to develop a consensus on the urban design elements to be incorporated into the final guideway designs. The process will include activities to solicit community input in the affected neighborhoods. Actions taken to help achieve integration with the local design context during the context-sensitive solutions process will include the following: • Design HST stations and associated structures such as elevators, escalators, and walkways to be attractive architectural elements or features that add visual interest to the streetscapes near them. • Design HST station parking structures and adjacent areas to integrate visually into the areas where they would be located. Where the city has adopted applicable downtown design guidelines, the parking structures and adjacent areas will be designed to be compatible with the policies and principles of those guidelines. • For the elevated guideways and columns, incorporate architectural elements, such as graceful curved or tapered sculptural forms and decorative surfaces, to provide visual interest. Include decorative texture treatments on large-scale concrete surfaces such as parapets and other portions of elevated guideways. Include a variety of texture, shadow lines, and other surface articulation to add visual and thematic interest. Closely coordinate the design of guideway columns and parapets with station and platform architecture to promote unity and coherence where guideways lie adjacent to stations. • Integrate trees and landscaping into the station streetscape and plaza plans where possible to soften and buffer the appearance of guideways, columns, and elevated stations. This will be consistent with the principles of crime prevention through environmental design. For the stations, structures, and related open spaces: incorporate design features that provide interest and reflect the local design context. These	review plans to verify compliance with measure.					reporting	City of Fresno

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	features could include landscaping, lighting, and public art.							
	VQ-MM#3a: Integrate the Elevated Guideways with Affected City Parks, Trails, and Urban Core Design Guidelines. During development of the final design, the Authority will work with the affected cities and counties to develop a project site and landscape design plan for the areas disturbed by the project. As a result of following these plans, the design features identified in VQ-MM#3 and the park mitigation measure PK-MM#3 will be implemented.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with measure.	X	X			Final design and Construction/Monthly reporting	Established local consultation process with City of Merced and City of Fresno
	VQ-MM#3b: Screen Elevated Guideways Adjacent to Residential Areas. Consistent with the design features developed under VQ-MM#3, the Authority will plant trees along the edges of the rights-of way in locations adjacent to residential areas. This will help reduce the visual contrast between the elevated guideway and the residential area. The species of trees to be installed will be selected on the basis of their mature size and shape, growth rate, hardiness, and drought tolerance. No species that is listed on the Invasive Species Council of California's list of invasive species will be planted. The crowns of trees used should ultimately be tall enough so that upon maturity they will partially, or fully, block or screen views of the elevated guideway from adjacent at-grade areas. Trees should allow ground-level views under the crowns (with pruning if necessary) while not interfering with the 15-foot clearance requirement for the guideway. The trees will be continuously maintained and appropriate irrigation systems will be installed within the tree planting areas. Invasive Species Council of California's list of invasive species will be planted. The landscaped areas will be continuously maintained and appropriate irrigation systems will be installed.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with measure.	X	X			Final design and Construction/Monthly reporting	Established local consultation process with City of Merced and City of Fresno
VQ #11. Sound Barrier and Retaining Wall Would Block Views.	**VQ-MM#5: Provide Landscape Treatments along the HST Project Overcrossings and Retained Fill Elements of the HST.** Upon the completion of construction, the Authority will plant the surface of the ground supporting the overpasses (slope-fill overpasses) and retained fill elements with vegetation consistent with the surrounding landscape in terms of vegetative type, color, texture, and form. During final design, the Authority will consult with the affected cities and counties regarding the landscaping program for planting the slopes of the overcrossings and retained fill. Plant species will be selected on the basis of their mature size and shape, growth rate, and drought tolerance. No species that is listed on the Invasive Species Council of California's list of invasive species will be planted. The landscaping will be continuously maintained and appropriate irrigation systems will be installed, if needed. Where wall structures supporting the overpasses or retained fill are proposed, the structure will employ architectural details and low-maintenance trees and other vegetation to screen the structure, minimize graffiti, and reduce the effects of large walls. Surface coatings will be applied on wood and concrete to facilitate cleaning and the removal of graffiti. Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable time after notification.	**Implementing Party:** Contractor/Authority **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with measure.			X		Pre and Post Construction/monthly reporting	Contract Requirements/ Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	VQ-MM#6: Provide Sound Barrier Treatments. The Authority will design a range of sound barrier treatments for visually sensitive areas, such as those where residential views of open landscaped areas would change or in urban areas where sound barriers would adversely affect the existing character and setting. The Authority will develop the treatments during final design and integrate them into the final project design. The treatments will include, but are not limited to, the following: • Sound barriers along elevated guideways may incorporate transparent materials, where sensitive views would be adversely affected by solid sound barriers. • Sound barriers will use non-reflective materials and will be of a neutral color. • Surface design enhancements and vegetation appropriate to the visual context of the area will be installed with the sound barriers. Vegetation will be installed consistent with the provisions of VQ-MM#5. Surface enhancements will be consistent with the design features and will include architectural elements (i.e. stamped pattern, surface articulation, and decorative texture treatment as determined acceptable to the local jurisdiction. Surface coatings will be used on wood and concrete sound barriers to facilitate cleaning and the removal of graffiti.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to review construction plans to verify compliance with this measure.		X			Construction/monthly reporting	Contract Requirements/ Specifications
	VQ-MM#7: Screen Traction Power Distribution Station. Upon completion of station construction, the Authority will screen the traction power substations (located at approximately 30-mile intervals along any of the HST alternatives) from public view through the use of landscaping or solid walls/fences. This will consist of context-appropriate landscaping of a type and scale that does not draw attention to the station. Plant species will be selected on the basis of their mature size and shape, growth rate, hardiness, and drought tolerance. No species that is listed on the Invasive Species Council of California's list of invasive species will be planted. The landscaping will be continuously maintained and appropriate irrigation systems will be installed within the landscaped areas. Walls will be constructed of cinder-block or similar material and will be painted a neutral color to blend in with the surrounding context. If a chain-link or cyclone fence is used, it will include wood slats in the fencing. Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable period as agreed between the Authority and local jurisdiction.	**Implementing Party:** Contractor/Authority **Monitoring/Reporting Party:** Mitigation Manager to review construction plans to verify compliance with this measure.			X		Post Construction	Contract Requirements/ Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
VQ IMPACT #12. Traction Power Distribution Stations Would Alter Visual Character or Block Views.	**VQ-MM#7: Screen Traction Power Distribution Station.** Upon completion of station construction, the Authority will screen the traction power substations (located at approximately 30-mile intervals along any of the HST alternatives) from public view through the use of landscaping or solid walls/fences. This will consist of context-appropriate landscaping of a type and scale that does not draw attention to the station. Plant species will be selected on the basis of their mature size and shape, growth rate, hardiness, and drought tolerance. No species that is listed on the Invasive Species Council of California's list of invasive species will be planted. The landscaping will be continuously maintained and appropriate irrigation systems will be installed within the landscaped areas. Walls will be constructed of cinder-block or similar material and will be painted a neutral color to blend in with the surrounding context. If a chain-link or cyclone fence is used, it will include wood slats in the fencing. Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable period as agreed between the Authority and local jurisdiction.	**Implementing Party:** Contractor/Authority **Monitoring/Reporting Party:** Mitigation Manager to review construction plans to verify compliance with this measure.			X		Post Construction	Contract Requirements/ Specifications
Cultural and Paleontological Resources								
Archaeological Resources								
Arch#1: Effect on Significant Prehistoric and Historic-Era Archaeological Resources During Construction	**Arch-MM#1: Conduct Archaeological Training.** Prior to ground-disturbing activities within the project alternatives, a qualified professional archaeologist, who meets the SOI's Standards for Archaeology, will develop a training program and printed material to be presented to construction personnel. The purpose of this training and accompanying materials will be to familiarize construction personnel with the relevant legal (Section 106/NEPA/CEQA) context for cultural resources of the project and with the types of cultural sites, features, and artifacts that could be uncovered during construction activities. These training sessions will be conducted prior to commencing construction within discrete portions of the project alternatives or as needed as construction crews and supervisors may change. The archaeological training program is further detailed in the ATP, which was developed with input from all consulting parties, including: • Merced County • City of Merced • City of Merced Design Review Board/Commission and Historic Preservation Commission • Fresno County • City of Fresno • City of Fresno Historic Preservation Program • Fresno County Landmarks and Records Advisory Commission • Madera County • City of Madera • California SHPO	**Implementing Party:** Qualified Professional Archaeologist **Monitoring/Reporting Party:** Qualified Professional Archaeologist	X				Prior to ground-disturbing activities/weekly monitoring See below for Section 106 MOA Reporting Requirements	Worker Environmental Awareness Program training ATP MOA An Unanticipated Discoveries Plan is a part of the ATP and has been developed, in coordination with the consulting parties, to detail the specific procedures to be followed if archaeological materials are found during construction. Implement an ADRP if the circumstances warrant an ADRP. The Authority will provide the ADRP, as an element of the treatment plan prepared for the section, to the MOA signatories and MOA concurring parties for review and comment. Programmatic Agreement (PA)

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Mitigation Timing: Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• ACHP In addition, consultation is being undertaken with participating parties and entities that have expressed a formal interest in being involved with the project, including Native American tribes. The ATP reflects the input of all parties. The ATP is a living document, monitored by all of the consulting parties so that compliance activities and mitigation commitments can be tracked. The ATP is tied to the MOA, which contains compliance and tracking stipulations tied to each specific mitigation item. The combination of the ATP and the MOA, along with ongoing coordination with the consulting parties, tracks and measures the commitments.							
	Arch-MM#2: Halt Work in the Event of an Archaeological Discovery. If any cultural resources are discovered during ground-disturbing activities, all work within 50 feet of the resources will halt, and the project proponent will consult with a qualified archaeologist to assess the significance of the find and any work may proceed on other parts of the project site while mitigation for historical resources or unique archaeological resources is being carried out. An Unanticipated Discoveries Plan will be developed in coordination with the consulting parties to detail the specific procedures to be followed if archaeological materials are found during construction. This plan is a part of the ATP, which is also being developed through a consultative process. The California State Lands Commission (CSLC) will be notified if the find is a cultural resource on or in the submerged lands of California, consequently under the jurisdiction of the CSLC. The project proponent will comply with all applicable rules and regulations promulgated by CSLC with respect to cultural resources located in submerged lands, and in accordance with the Programmatic Agreement (PA) and the Memorandum of Agreement (MOA). If human remains are encountered, the project proponent will comply with applicable laws and regulations regarding notification and disposition of the remains. If the coroner determines that the remains are Native American, the coroner will notify the Native American Heritage Commission (NAHC). If any find is determined to be significant, the project proponent and the archaeologist will meet to determine the appropriate avoidance measures or other appropriate mitigation in conjunction with the State Historic Preservation Officer (SHPO) and the MOA signatories. All significant cultural materials recovered will be, as necessary and at the discretion of the consulting archaeologist, subject to scientific analysis, professional museum curation, and documentation according to current professional standards as determined in the MOA. In considering any suggested mitigation proposed by the consulting archaeologist to mitigate impacts on historical resources or unique archaeological resources, a determination will be made whether avoidance is necessary and feasible in light of factors such as the nature of the find, project design, costs, and other considerations. If, in consultation with the consulting archaeologist, it is determined that a	**Implementing Party:** Qualified Professional Archaeologist, in consultation with the California State Lands Commission, the Native American Heritage Commission, and the State Historic Preservation Office, as appropriate. **Monitoring/Reporting Party:** Archaeological Monitor, in coordination with Authority, SHPO and appropriate consulting agencies		X			Construction See below for Section 106 MOA Reporting Requirements	ATP MOA

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	significant archaeological resource is present and that the resource could be adversely affected by the proposed project, one of the following actions may be followed, as feasible: • If prudent and feasible, redesign the project to avoid any adverse effect on the significant archaeological resource. • Implement Arch-MM#3, Intentional Site Burial for Site Preservation. • Implement an archaeological data recovery program (ADRP) (unless the archaeologist determines that the archaeological resource is of greater interpretive use than research significance and that interpretive use of the resource is feasible). If the circumstances warrant an ADRP, such a program will be conducted. Together with a project archaeologist, the scope of the ADRP will be determined. The archaeologist will prepare a draft ADRP, which will identify the scientific/historical research questions that are applicable to the expected resource, the data classes the resource is expected to possess, and how the expected data classes will address the applicable research questions. The Authority will provide the ADRP, as an element of the treatment plan prepared for the section, to the MOA signatories and MOA concurring parties for review and comment. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed project. Destructive data recovery methods will not be applied to portions of the archaeological resources if nondestructive methods are practical. Performance tracking of this mitigation measure will be based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.							
	Arch-MM#3: Plan an Intentional Site Burial Preservation In-Place. If project engineering concludes that avoidance is not feasible, a process to determine whether the site can be preserved through intentional site burial will be considered. When complete avoidance is not possible, preservation in-place is the preferred form of mitigation for an "historical resource of an archaeological nature" because it retains the relationships between artifact and context, and may avoid conflicts with groups associated with the site. The process, presented in overview below, is specified in detail in the ATP, which is being developed in coordination with all of the project's consulting parties. To intentionally bury a site, it will be necessary to conduct test excavations to determine the vertical and horizontal extent of the identified resources discovered as planning proceeds or through accidental discovery. If excavations have not yet been conducted for the purpose of evaluating the site for eligibility in accordance with Section 106 of the NHPA, the Authority will contract with a qualified archaeologist to conduct a formal excavation of the site to delineate the site boundaries and to determine the site's eligibility for	**Implementing Party:** Qualified Professional Archaeologist **Monitoring/Reporting Party:** Qualified Professional Archaeologist, in coordination with the Authority, SHPO and appropriate consulting agencies	X	X	X		Prior to construction/Weekly reporting See below for Section 106 MOA Reporting Requirements	ATP MOA

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	the CRHR or NRHP. If found to be eligible and avoidance is not possible, consideration will be given to intentional site burial. The contracted archaeologist will, in addition to the formal delineation of the site boundaries, prepare and implement a design plan to dictate the conditions of the intentional site burial according to the recommendations discussed in the National Park Service Technical Brief Number 5, Intentional Site Burial: A Technique to Protect Against National or Mechanical Loss (Thorne 1991). Among the requirements of an effective capping, the mechanical process of burying the site must be designed in a manner that will make sure that the site matrix is protected during the placement process and during the operation of the HST. Preconstruction testing can be used to determine the construction equipment and fill material load limits that are allowable without causing compression or warpage of the artifact and feature components of the site. If the preconstruction testing determines that compression or warpage of the site is probable and the mitigation will not effectively reduce the effects of the project to less than significant levels, additional mitigation, such as data recovery, will be necessary. Furthermore, if it is determined that the engineering requirements of the construction and operation of the HST at the location of the site prohibit the effective avoidance of the site, or if the surrounding conditions prohibit the protection or preservation of the archaeological components, the mitigation of data recovery will be the only feasible mitigation (see Arch-MM#2). In addition, the Authority will make provisions with the contracted archaeologist to monitor the site after the burial process is completed. Performance tracking of this mitigation measure will be based upon successful implementation and the approval of the documentation by the SHPO and appropriate consulting parties.							

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Arch-MM#4: Conduct Archaeological Monitoring in Proximity to Identified Sites or Areas of Sensitivity. Ground-disturbing activities that have the potential to affect archaeological remains may occur in areas that have been identified as either the location of a known archaeological site, or in an area known to be sensitive for the presence of buried cultural resources. The Authority will retain the services of a qualified archaeological monitor who will be present during all ground-disturbing construction activities occurring in native sediments/soils. The process for archaeological monitoring, presented in overview below, is specified in the ATP, developed in coordination with all of the project's consulting parties. In the event that cultural resources are exposed during construction, following guidelines presented in the ATP, the archaeological monitors will be empowered to temporarily halt activities in the immediate vicinity of the discovery while it is evaluated for significance. If it is determined that the cultural resources exposed appear to be eligible for the National Register of Historic Places or the California Register of Historical Resources, then the archaeologist will conduct additional investigation to avoid impacts to or develop a plan for treatment of these resources. The Authority will seek Native American input and consultation under terms and conditions specified in the ATP and MOA. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.	**Implementing Party:** Qualified Professional Archaeologist **Monitoring/Reporting Party:** Archaeological Monitor, in coordination with the Authority, FRA, SHPO, and appropriate consulting agencies	X	X	X		Construction/Weekly reporting See below for Section 106 MOA Reporting Requirements	ATP MOA
Section 106 MOA Reporting Requirements								
	See Description for Arch MM#1-4	**Implementing Party:** Contractor and Qualified Professional Archaeologist **Monitoring/Reporting Party:** Archaeological Monitor, in coordination with the Authority, FRA, SHPO and appropriate consulting agencies					Monthly progress reports documenting the implementation of the ATP and BETP to be prepared by the implementing contractor, to the cultural resources point of contact at the Authority and FRA. Annual Report prepared by the Authority, in consultation with FRA, documenting the implementation of the MOA	ATP Section 106 MOA
Paleontological Resources								
Pale#2: Effect on Paleontological Resources during	**Pale-MM#1: Engage a Paleontological Resources Specialist to Direct Monitoring during Construction.** At least 120 days prior to construction, a paleontological resources specialist (PRS) will be designated for the project and will be responsible for determining where and when paleontological resources	**Implementing Party:** A paleontological resources specialist (PRS) & paleontological resources monitors • Monitoring/Reporting Party: Authority	X	X			Identify PRS at least 120 days prior to construction The PRS will document any discoveries, as	Paleontological Resource Monitoring and Mitigation Plan (PRMMP)

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Mitigation Timing: Construction	Mitigation Timing: Post-Construction	Mitigation Timing: Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Construction	monitoring should be conducted. Paleontological resources monitors (PRMs) will be selected by the PRS based on their qualifications, and the scope and nature of their monitoring will be determined and directed based on the Paleontological Resource Monitoring and Mitigation Plan (PRMMP). The PRS will be responsible for developing and implementing the Worker Environmental Awareness Program training. All management and supervisory personnel and construction workers involved with ground-disturbing activities will be required to take this training prior to beginning work on the project and will be provided with the necessary resources for response in case paleontological resources are found during construction. The PRS will document any discoveries, as needed, evaluate the potential resource, and assess the significance of the find.						needed, evaluate the potential resource, and assess the significance of the find.	
	Pale-MM#2: Prepare and Implement a PRMMP. Paleontological monitoring and mitigation measures are restricted to those construction-related activities that will result in the disturbance of paleontologically sensitive sediments. The PRMMP will include a description of when and where construction monitoring will be required; emergency discovery procedures; sampling and data recovery procedures; procedures for the preparation, identification, analysis, and curation of fossil specimens and data recovered; preconstruction coordination procedures; and procedures for reporting the results of the monitoring and mitigation program. In general, the monitoring program will reflect site-specific construction of the selected option. The PRMMP will be consistent with Society of Vertebrate Paleontology guidelines (SVP 1995) for the mitigation of construction-related impacts on paleontological resources. The PRMMP will also be consistent with the SVP (1996a, b) conditions for receivership of paleontological collections and any specific requirements of the designated repository for any fossils collected.	**Implementing Party:** Paleontological resources monitor • Monitoring/Reporting Party: Authority	X	X			Construction	PRMMP Worker Environmental Awareness Program training
	Pale-MM#3: Halt Construction when Paleontological Resources Are Found. If fossil or fossil-bearing deposits are discovered during construction, regardless of the individual making a paleontological discovery, construction activity in the immediate vicinity of the discovery will cease. This requirement will be spelled out in both the PRMMP and the Worker Environmental Awareness Program. Construction activity may continue elsewhere provided that it continues to be monitored as appropriate. If the discovery is made by someone other than a PRM or the PRS, a PRM or the PRS will immediately be notified.	**Implementing Party:** The person that makes a paleontological discovery and/or the PRM or PRS **Monitoring/**Reporting Party: Mitigation Manager and PRM/PRS to halt construction and notify Authority of discovery.	X	X			Construction/weekly reporting	A Built Environment Treatment Plan (BETP) provides additional detail on the methodology for the avoidance of adverse vibration effects, and how that will be implemented during the project.
Historic Architectural Resources								
Hist#1: Effect on Historically Significant Built-Environment Resources During Construction	**Hist-MM#1: Avoid Adverse Vibration Effects.** The HST Project will develop construction methods to avoid indirect adverse effects or substantial adverse change to historic properties from vibration caused by construction activities. Vibration from impact pile-driving during construction could cause the physical destruction, damage, or alteration of historic properties or historical resources if the pile-driving is within 25 to 50 feet of the building. Because this impact pile-driving could cause adverse effects or substantial adverse changes, alternative construction methods causing less than 0.12 peak particle velocity of one inch per second (0.12 PPV in/sec) measured at the receptor would be	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies.	X	X	X		Preconstruction surveys and Construction	BETP PA MOA

Table 1, Continued

Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	developed for construction activities near historic properties or historical resources if they are determined to be extremely susceptible to vibration damage. If piling is more than 50 feet from buildings, or if alternative methods such as push piling or auger piling can be used, damage from construction vibration should not be an issue. Preconstruction surveys conducted at locations within 50 feet of piling would document existing condition of buildings in case there is an issue during or after construction. The mitigation measure described above is consistent with FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment (2005) for evaluation of noise and vibration impacts associated with HSTs. A BETP has been prepared that provides additional detail on the methodology for the avoidance of adverse vibration effects, and how that will be implemented during the project. The BETP has been developed in coordination with the project's consulting parties to verify that all parties have a role in the generation of this plan. Performance tracking of this mitigation measure is based upon successful implementation and the approval of the documentation by the SHPO and appropriate consulting parties.							
	Hist-MM#2: Develop Protection and Stabilization Measures. The BETP identifies historic properties/historical resources that require protection and/or stabilization prior to the start of construction of the project. Properties subject to this mitigation activity include any that are physically affected, and/or relocated, and/or in close enough proximity to require protection. This mitigation will be used to confirm that adverse effects on historic properties/historical resources will be either avoided entirely, or minimized to the extent possible. This mitigation was developed in consultation with the SHPO and the MOA signatories, as required by the PA. Such measures will include, but will not be limited to, vibration monitoring of construction in the vicinity of historic properties; cordoning off of resources, such as traffic, equipment storage, and personnel, from construction activities; shielding of resources from dust or debris; and stabilization of buildings adjacent to construction. For buildings that are to be moved, such measures will include stabilization of buildings and structures before, during, and after relocation; protection of buildings and structures during temporary storage; and relocation at a new site and during subsequent rehabilitation. Moving buildings could result in minor impacts on air emissions from equipment and vehicles and minor effects on developed or undeveloped sites. Protection and stabilization measures proposed for impacted resources are presented in the BETP, a plan that is being developed with critical input from all of the project's consulting parties. Performance tracking of this mitigation measure is based upon successful implementation and the approval of the documentation by the SHPO and appropriate consulting parties	**Implementing Party:** Contractor and Authority, in consultation with the landowner, land-owning agencies, SHPO, and the MOA signatories, as required by the Programmatic Agreement (PA). **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X	X			Preconstruction surveys and Construction/weekly reporting	BETP PA Historic Structure Report (HSR) and the relocation plan MOA
	Hist-MM#3: Minimize Adverse Effects through Relocation of Historic Structures. The BETP identifies historic properties/historical resources that will be relocated to help avoid destruction and minimize the direct adverse effect of their physical damage or alteration. The plan for relocation and implementation	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X	X			Preconstruction surveys and Construction/weekly reporting	BETP Photographs and nomination document

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	of relocation will take place prior to construction. The relocation of the historic properties/historical resources will take into account the historic site and layout (i.e., the orientation of the buildings to the cardinal directions), as well as their potential re-use. All structures will be thoroughly recorded in a Historic Structure Report (HSR) (see below), and the relocation plan will provide for stabilization of the structures before, during, and after the move. The project's consulting parties provided input to develop the relocation of historic structures section of the BETP in an effort to provide a comprehensive and thorough approach that would best meet the needs of the parties as well as the resources. Relocating historic structures has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful relocation of resources and the approval of the process by the SHPO and appropriate consulting parties.							
	Hist-MM#5: Prepare and Submit NRHP Nominations. The BETP identifies specific historic properties/historical resources for nomination to the NRHP Program of the National Park Service (NPS). Properties subject to this mitigation will be treated in consultation with the landowner, or land-owning agencies, and the Authority. Current photographs of the property used in the nomination(s) will be taken prior to the start of project construction. The nomination document may also use other current and/or historic images prepared as part of other mitigation activities. Preparing and submitting NRHP nominations has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X	X			Prior to construction/monthly reporting	BETP Photographs and nomination document
	Hist-MM#6: Prepare and Submit CRHR Nominations. The BETP identifies specific historical resources for nomination to the CRHR Program at the California OHP. Current photographs of the resource used in the nomination(s) will be made prior to the start of construction. The nomination document may also use current and/or historic images prepared as part of other mitigation activities. Properties subject to this mitigation will be treated in consultation with the landowner, or land-owning agencies, and the Authority. Preparing and submitting CRHR nominations has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X	X			Prior to construction	BETP Photographs and recordation document per National Parks Service (NPS) HABS/HAER/HALS guidelines (up to Level II HABS written data standards)
	Hist-MM#7: Prepare and Submit HABS/ HAER/ HALS Documentation. The BETP identifies specific historical resources that would be physically altered, damaged, relocated, or destroyed by the project and that may be documented in compliance with the HABS/HAER/HALS programs. Consultation with the SHPO, NPS, and the consulting parties will be required if any of the resources must be documented to these standards.	**Implementing Party:** Authority, in consultation with the Western Regional Office of the NPS **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X				Prior to construction	BETP HSR

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
	Prior to the start of construction, in consultation with the Western Regional Office of the NPS, Oakland, California, large-format (4-inch by 5-inch, or larger, negative-size) black and white photographs will be taken of these historic properties/historical resources showing them in context, as well as details of character-defining features. The photographs will be processed for archival permanence in accordance with HABS/HAER/HALS photographic specifications. Each view will be fully captioned and, if necessary, perspective corrected. Oblique aerial photography will be considered as a photographic recordation option in these coordination efforts. The recordation will follow the NPS HABS/HAER/HALS guidelines, and the report format, views, and other documentation details will be coordinated with the NPS. It is anticipated that the recordation of historic properties will be completed to Level II HABS written data standards and will include archival and digital reproduction of historic images, plans, and drawings, if available. Copies of the documentation will be offered to the appropriate local governments, historical societies and agencies, and libraries. The documentation will also be offered in printed and electronic form to any repository or organization upon which SHPO, the Authority, and local agency with jurisdiction over the property, through consultation, may agree. The electronic copy of the report may also be placed on an agency or organization's web site. Preparing and submitting HABS/HAER/HALS documentation has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.							
	Hist-MM#8: Prepare Historic Structure Reports. The BETP identifies historic properties/historical resources that would be physically altered, damaged, or relocated that would be subject to an HSR. The HSR will be prepared prior to the start of construction. The HSR will follow the general guidelines for such reports as described in the California OHP publication, *Historic Structure Report Format.*[3] The scope of each HSR will be developed in consultation with the land-owning agencies, the SHPO, and appropriate consulting parties. The HSR will include documentation of existing landscaping, if appropriate. The HSRs may be used in the ongoing planning process and re-use of the properties, and may be coordinated with the other mitigation documentation activities, such as HABS/HAER records. Preparing HSRs has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties.	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies	X				Prior to construction	BETP Interpretive exhibits Informative permanent metal plaques

3 California Office of Historic Preservation. 2012. *Historic Structure Report Format.* Available at http://ohp.parks.ca.gov/?page_id=1069. Accessed June 2012. Sacramento, CA.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	Hist-MM#9: Prepare Interpretive Exhibits. Some historic properties/historical resources are in the BETP for historic interpretation. Interpretive exhibits will provide information regarding the specific historic property or historical resource. The interpretive exhibits will utilize images, narrative history, drawings, or other material produced for the mitigation described above, including the HABS/HAER reports, NRHP and CRHR nominations, or other archival sources. The interpretive exhibits may be in the form of, but are not limited to, interpretive display panels and/or printed material for dissemination to the public. The interpretive exhibits may be installed at local libraries, historical societies, or public buildings. All historic properties/historical resources demolished by the project will be the subject of informative permanent metal plaques that will be installed at the site of the demolished historic property, or at nearby public locations. The plaques will provide a brief history of the property, its engineering/architectural features and characteristics, and the reasons for and date of its demolition. Preparing interpretive exhibits has proven to be effective in achieving the stewardship goals of Section 106 and CEQA review. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies			X		Post-construction/annual reporting	BETP Photographic documentation Plan for repairs to historic properties
	Hist-MM#10: Plan Repair of Inadvertent Damage. The BETP provides a plan for the treatment of inadvertent damage to historic properties/historical resources. The plan states that damage resulting from the project to any of the historic properties/historical resources near construction activities will be treated in accordance with the SOI's Standards for the Treatment of Historic Properties. The HSR, and/or HABS/HAER, recordation will photographically document the condition of historic properties/historical resources prior to the start of construction to establish the baseline condition for assessing damage. A copy of this photographic documentation will be provided to the landowner or land-owning agencies. Prior to implementation, plans for any repairs to historic properties will be submitted for SHPO review and comment. Performance tracking of this mitigation measure is based upon successful treatment of any damage to historic properties/historical resources and approval of that work by the SHPO and appropriate consulting parties.	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority, in consultation with the SHPO and appropriate consulting agencies		X	X		Prior to construction	Historic American Building Survey (HABS)/Historic American Engineering Record (HAER)/ Conformance with SOI's Standards of Rehabilitation
	PK-MM#5: Address Noise at Roeding Park with City of Fresno. To mitigate the noise impacts, a sound barrier approximately 2,800 feet in length will be constructed. It is assumed that a sound barrier will be 10 to 14 feet tall and have aesthetic treatment. A 10-foot-high sound barrier will reduce noise to 64 dBA at 250 feet inside the park and residual noise effects will occur. A 14-foot-high sound barrier will reduce noise effects to within 1 dB of no impact. Aesthetic treatment of the sound barrier will be selected with input from the community.	**Implementing Party:** Contractor to identify sound barriers in construction plans. **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with this measure.	X				Design and Construction	The Authority will continue to work with the City of Fresno as the resource owner to address noise impacts. It is possible that the City of Fresno would view the projected noise levels as acceptable and preferable to the implementation of mitigation measures.

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
Hist#2: Effect on Historically Significant Built-Environment Resources During Operation	**Hist MM#4: Minimize Adverse Operational Noise Effects**. The BETP will identify historic properties/historical resources that will be subject to treatment to help minimize indirect adverse effects caused by operational noise of the HST Project. Properties subject to this mitigation will be identified in the BETP and will be treated in consultation with the landowner, or land-owning agencies, and the CEQA lead agency (Authority). Preliminary project design options, such as noise walls, have been developed to help reduce noise impacts and follow FRA methodologies for noise abatement. The measures proposed to help minimize adverse effects caused by operational noise will be presented in more detail in the BETP, a plan that is being developed with critical input from all of the project's consulting parties. Performance tracking of this mitigation measure is based upon successful implementation and approval of the documentation by the SHPO and appropriate consulting parties. Design options implemented as part of mitigation measures, such as noise walls, have the potential to cause additional impacts, such as visual and setting alterations. Additional environmental studies will be conducted to address these potential impacts as necessary. These options will be further developed during project design and will be implemented during construction. Historic properties historical resources subject to this mitigation measure will be thoroughly recorded in the appropriate format of the Historic American Building Survey (HABS)/Historic American Engineering Record (HAER)/ Historic American Landscape Survey (HALS) programs (see Hist-MM#7) prior to construction of the HST Project. The mitigation measure described above is consistent with FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment (2005) for evaluation of noise and vibration impacts associated with HSTs.	**Implementing Party:** Contractor, in consultation with the landowner, or land-owning agencies, and the CEQA lead agency. **Monitoring/Reporting Party:** Authority	X	X	X		Preconstruction and Construction	BETP PA Historic American Building Survey (HABS)/Historic American Engineering Record (HAER)/ Historic American Landscape Survey (HALS) programs
	N&V-MM#1: Construction noise mitigation measures. Monitor construction noise to verify compliance with the limits. Provide the contractor the flexibility to meet the FTA construction noise limits in the most efficient and cost-effective manner. The contractor would have the flexibility of either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. To meet required noise limits, the following noise control mitigation measures will be implemented as necessary, for nighttime and daytime: • Install a temporary construction site sound barrier near a noise source. • Avoid nighttime construction in residential neighborhoods. • Locate stationary construction equipment as far as possible from noise-sensitive sites. • Re-route construction-related truck traffic along roadways that will cause the least disturbance to residents. • During nighttime work, use smart back-up alarms, which automatically adjust the alarm level based on the background noise level, or switch off back-up alarms and replace with spotters.	**Implementing Party**: Contractor to incorporate measures into specifications. **Monitoring/Reporting Party**: Mitigation Manager will verify compliance during construction.		X			Construction/weekly reporting	Contract Requirements/ Specifications

Table 1, Continued
Mitigation Measures and Implementation Plan

Significant Impact	Mitigation Measure	Implementing Party and Monitoring /Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	• Use low-noise emission equipment. • Implement noise-deadening measures for truck loading and operations. • Monitor and maintain equipment to meet noise limits. • Line or cover storage bins, conveyors, and chutes with sound-deadening material. • Use acoustic enclosures, shields, or shrouds for equipment and facilities. • Use high-grade engine exhaust silencers and engine-casing sound insulation. • Prohibit aboveground jackhammering and impact pile driving during nighttime hours. • Minimize the use of generators to power equipment. • Limit use of public address systems. • Grade surface irregularities on construction sites. • Use moveable sound barriers at the source of the construction activity. • Limit or avoid certain noisy activities during nighttime hours. To mitigate noise related to pile driving, the use of an augur to install the piles instead of a pile driver would reduce noise levels substantially. If pile driving is necessary, limit the time of day that the activity can occur.							
Hist#3: Effect on Historically Significant Built-Environment Resources During Operation The Hybrid Alternative would cause substantial adverse change to 1 historical resource.	**PK-MM#5: Address Noise at Roeding Park with City of Fresno** To mitigate the noise impacts, a sound barrier approximately 2,800 feet in length will be constructed. It is assumed that a sound barrier will be 10 to 14 feet tall and have aesthetic treatment. A 10-foot-high sound barrier will reduce noise to 64 dBA at 250 feet inside the park and residual noise effects will occur. A 14-foot-high sound barrier will reduce noise effects to within 1 dB of no impact. Aesthetic treatment of the sound barrier will be selected with input from the community.	**Implementing Party:** Contractor to identify sound barriers in construction plans. **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with this measure.	X				Design and Construction	The Authority will work with the City of Fresno as the resource owner to address noise impacts. It is possible that the City of Fresno would view the projected noise levels as acceptable and preferable to the implementation of mitigation measures.
	N&V-MM#1: Construction noise mitigation measures. See description above.	**Implementing Party**: Contractor to incorporate measures into specifications. **Monitoring/Reporting Party**: Mitigation Manager will verify compliance during construction.		X			Construction/weekly reporting	Contract Requirements/ Specifications

Table 2
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
Noise and Vibration								
N&V#2: Construction Vibration Construction impacts would have moderate intensity under NEPA, but due to the temporary nature and adherence to local noise ordinances, construction noise and vibration impacts would not be significant under NEPA.	**N&V-MM#2: Construction vibration mitigation measures.** Building damage from construction vibration is only anticipated from impact pile driving at very close distances to buildings. If piling is more than 25 to 50 feet from buildings, or if alternative methods such as push piling or augur piling can be used, damage from construction vibration is not expected to occur. Other sources of construction vibration do not generate high enough vibration levels for damage to occur. When a construction scenario has been established, preconstruction surveys will be conducted at locations within 50 feet of piling to document the existing condition of buildings in case damage is reported during or after construction. Damaged buildings would be repaired or compensation paid.	**Implementing Party:** Contractor to incorporate measure into specifications. **Monitoring/Reporting Party:** Mitigation Manager will verify compliance during construction.	X	X	X		Ongoing monitoring during construction/post-construction monitoring as needed to assess damage to buildings	Contract Requirements/Specifications
N&V#3: Severe Operational Vibration Impacts Vibration levels from HST operations are not projected to exceed the threshold outside the right-of-way along the Hybrid alternative, and this impact would not be significant under NEPA.	**N&V-MM#7: Implement Proposed California High-Speed Train Project Noise and Vibration Mitigation Guidelines.** Implement vibration-reducing measures such as those listed in Table 3.4-28 [of the Final Project EIR/EIS]. The table lists where the mitigation procedure will be applied, such as at the source, sensitive receiver, or along the propagation path from the source to the sensitive receiver.	**Implementing Party:** Contractor to identify noise barriers in construction plans. **Monitoring/Reporting Party:** Mitigation Manager will review construction plans to verify compliance with measure.	X	X	X		Construction/weekly reporting	Noise and Vibration Mitigation Guidelines
Public Utilities and Energy								
PUE #1: Conflicts with Existing Substations. The impacts on public utilities during operation of the HST would not be significant under NEPA.	**PUE-MM#1**: **Redesign to avoid substation.** Roadway modifications associated with the Hybrid Alternative would affect a substation. The final project design will avoid these conflicts through refinements of project features.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager/Authority in coordination with affected utility provider.	X				Prepare construction management plan/weekly reporting	Condition of Design/Build Contract

Table 2, Continued
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
Safety and Security								
S&S #2: Increased demand for fire, rescue, and emergency services at stations and HMF. No significant impacts were identified under NEPA.	**S&S-MM#2: Monitor response of local fire, rescue, and emergency service providers to incidents at stations and the HMF and provide a fair share of cost of service.** Upon approval of the Merced to Fresno Section, the Authority will monitor service levels in the vicinity of the Merced and Fresno stations, in order to determine baseline service demands. "Service levels" consist of the monthly volume of calls for fire and police protection, as well as city- or fire protection district-funded EMT/ambulance calls that occur within the station and HMF site service areas. Prior to operation of the stations for HST service, the Authority will enter into an agreement with the public service providers of fire, police, and emergency services to fund the Authority's fair share of services above the average baseline service demand level for the station and HMF service areas (as established during the monitoring period). The fair share will be based on projected passenger use for the first year of operations, with a growth factor for the first 5 years of operation. This cost-sharing agreement will include provisions for ongoing monitoring and future negotiated amendments as the stations are expanded or passenger use increases. Such amendments will be made on a regular basis for the first 5 years of station operation, as will be provided in the agreement. To make sure that services are made available, impact fees will not constitute the sole funding mechanism, although impact fees may be used to fund capital improvements or fixtures (for example, police substation, additional fire vehicles, onsite defibrillators) necessary to service delivery. After the first 5 years of operation, the Authority will enter into a new or revised agreement with the public service providers of fire, police, and emergency services to fund the Authority's fair share of services. The fair share will take into account the volume of ridership, past record and trends in service demand at the stations and HMF site, new local revenues derived from station area development, and any services that the Authority may be providing at the station.	**Implementing Party:** Authority **Monitoring/Reporting Party:** Authority	X	X	X	X	Monitoring of service levels during construction in the vicinity of the Merced and Fresno stations to determine baseline service demands. Prior to operation of the stations for HST service	Authority to fund through fair share of services agreement.

Table 2, Continued
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
Socioeconomics, Communities, and Environmental Justice								
SO: The Project would result in impacts on property owners and businesses, including low income households and minority populations, and to maintain access to local businesses, residences, and emergency services. The impacts related to displaced residential and business properties and the impacts on school district funding would not be considered significant under NEPA.	**SO-MM#7:** Develop measures to minimize the potential for physical deterioration. The Authority will work with the communities on the design of these features consistent with Technical Memorandum 200.6, Aesthetic Guidelines for Non-Station Structures (Authority 2012). Local communities will provide input on the use of the area underneath the elevated guideway, which could be used as a trail or for business parking for new and existing businesses, making the area underneath the guideway an attractive setting for economic development or recreational uses. Where the elevated guideway is adjacent to residential areas, the Authority will plant trees along the edges of the rights-of-way to help reduce the visual contrast. The Authority will also plant vegetation within lands acquired for the project after construction is complete.	**Implementing Party:** Contractor and Authority in coordination with affected jurisdictions. **Monitoring/Reporting Party:** Authority	X		X		During Final Design/monthly and annual reporting	
	SO-MM#8: Provide access modifications to affected farmlands. In cases where partial property acquisitions result in the division of farmlands, the Authority will provide overcrossings or undercrossings of the HST guideway to allow continued access and use of farmlands. This would include the design of overcrossings or undercrossings to allow the passage of farm equipment. Refer to Section 3.14, Agricultural Lands, for additional information. This mitigation measure will be effective because it will maintain access to farmlands for farmers whose property is bisected.	**Implementing Party:** Contractor and Authority in coordination with affected jurisdictions. **Monitoring/Reporting Party:** Authority	X				Prior to acquisitions/monthly reporting	
SO#3: Displacement of Community Facility. Acquisition of a homeless shelter in the City of Merced. Impacts on community facilities in the cities of Merced and Fresno would be of moderate intensity. Also adequate available replacement sites currently exist for affected facilities and design could further avoid the impacts. The impacts would not be considered significant under NEPA.	**SO-MM#4: Implement measures to reduce impacts associated with the relocation of community facilities.** Minimize impacts associated with the acquisition of the homeless shelter in Merced by conducting outreach and coordinating with the facility prior to acquisition. Coordinate with the respective parties prior to land acquisition to reconfigure or relocate facilities, as necessary, to minimize disruption to activities. To reduce disruption to the use of these community facilities, the Authority will make sure that reconfiguring of land uses or buildings or relocating of community facilities is completed before the demolition of any existing structures. Work with the City of Merced and Merced City School District to facilitate the construction of the facilities prior to demolition of the existing structures. During the design process, the Outreach Team will conduct targeted outreach efforts for these facilities to understand and determine their needs for siting criteria. This mitigation measure will be effective in minimizing the impacts of the project by completing new facilities prior to relocation being necessary, and by involving affected facilities in the process of identifying new locations for their facilities.	**Implementing Party:** Authority **Monitoring/Reporting Party:** N/A	X	X			Final design and Prior to acquisitions/monthly reporting	Outreach efforts - recruitment, training, and job set-aside programs
	SO-MM#5: Continue outreach to disproportionately and negatively affected environmental justice communities of concern. The Authority will continue to conduct substantial environmental justice outreach activities in adversely affected neighborhoods to obtain resident feedback on potential	**Implementing Party:** Contractor and Authority in coordination with affected agencies **Monitoring/Reporting Party:** Authority	X				Prior to acquisitions/monthly reporting	Relocation Mitigation Plan

Table 2, Continued
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	impacts and suggestions for mitigation measures. Input from these communities will be used to refine project features during the design phase and facilitate the identification of the highest priority mitigation measures developed for the Merced to Fresno section. In addition, to offset any disproportionate effects, the Authority will develop special recruitment, training, and job set-aside programs so that minority and low-income populations are able to benefit from the jobs created by the project. This type of outreach is common for large infrastructure projects with long construction periods and has been found to be effective.							
Aesthetics and Visual Resources								
VQ#1: Visual Disturbance during Construction. Construction activities would cause visual impacts in urban areas. Under NEPA, construction impacts were determined to be of moderate intensity.	**VQ-MM#1: Minimize Visual Disruption During Construction and from Construction Activities.** Adhere to local jurisdiction construction requirements (if applicable) regarding construction-related visual/aesthetic disruption. In order to minimize visual disruption, construction will employ the following activities: ☐ • Minimize pre-construction clearing to that necessary for construction. ☐ Limit the removal of buildings to those that would obstruct project components. ☐ • When possible, preserve existing vegetation, particularly vegetation along the edge of construction areas that may help screen views. ☐ • After construction, regrade areas disturbed by construction, staging, and storage to original contours and revegetate with plant material similar in replacement numbers and type to that which was removed upon completion of construction, based upon local jurisdictional requirements. If there are no local jurisdictional requirements to follow, replace removed vegetation at a 1:1 replacement ratio for shrubs and small trees, and 2:1 replacement ratio for mature trees. For example, if 10 mature trees in an area are removed, replant 20 younger trees that after 5 to 15 years (depending upon the growth rates of the trees) would provide coverage that was similar to the coverage provided by the trees that were removed for construction. • To the extent feasible, do not locate construction staging sites within immediate foreground distance (0 to 500 feet) of existing residential, recreational, or other high-sensitivity receptors. Where such siting is unavoidable, staging sites will be screened from sensitive receptors using appropriate solid screening materials such as temporary fencing and walls. Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to verify compliance during construction.	X	X			Construction/Weekly reporting	Contract Requirements/ Specifications
	VQ-MM#3: Incorporate Design Criteria for Elevated and Station Elements That Can Adapt to Local Context. During final design of elevated guideways and the Merced and Fresno stations, the Authority will coordinate with local jurisdictions on the design of these facilities so that they are designed appropriately to fit in with the visual context of the areas near them. This will include the following activities: For stations: During the station design process, establish a local consultation	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to review plans to verify compliance with measure.	X	X			Final design and Construction/Monthly reporting	Established local consultation process with City of Merced and City of Fresno

Table 2, Continued
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing: Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	Implementation Mechanism or Tool
	process with the City of Merced and the City of Fresno to identify and integrate local design features into the station design through a collaborative context-sensitive solutions approach. The process will include activities to solicit community input in their respective station areas. This effort will be coordinated with the station area planning process that will be undertaken by those cities under their station area planning grants. For elevated guideways in cities or unincorporated communities: During the elevated guideway design process, establish a process with the city or county with jurisdiction over the land along the elevated guideway to advance the final design through a collaborative context-sensitive solutions approach. Participants in the consultation process will meet on a regular basis to develop a consensus on the urban design elements to be incorporated into the final guideway designs. The process will include activities to solicit community input in the affected neighborhoods. Actions taken to help achieve integration with the local design context during the context-sensitive solutions process will include the following: Design HST stations and associated structures such as elevators, escalators, and walkways to be attractive architectural elements or features that add visual interest to the streetscapes near them. Design HST station parking structures and adjacent areas to integrate visually into the areas where they would be located. Where the city has adopted applicable downtown design guidelines, the parking structures and adjacent areas will be designed to be compatible with the policies and principles of those guidelines. For the elevated guideways and columns, incorporate architectural elements, such as graceful curved or tapered sculptural forms and decorative surfaces, to provide visual interest. Include decorative texture treatments on large-scale concrete surfaces such as parapets and other portions of elevated guideways. Include a variety of texture, shadow lines, and other surface articulation to add visual and thematic interest. Closely coordinate the design of guideway columns and parapets with station and platform architecture to promote unity and coherence where guideways lie adjacent to stations. Integrate trees and landscaping into the station streetscape and plaza plans where possible to soften and buffer the appearance of guideways, columns, and elevated stations. This will be consistent with the principles of crime prevention through environmental design. For the stations, structures, and related open spaces: incorporate design features that provide interest and reflect the local design context. These features could include landscaping, lighting, and public art.							

Table 2, Continued
Voluntary Mitigation Measures per CEQA

Significant Impact	Mitigation Measure	Implementing Party and Monitoring / Reporting Party	Mitigation Timing					Implementation Mechanism or Tool
			Pre-Construction	Construction	Post-Construction	Operations	Implementation Schedule/ Reporting Schedule	
VQ#2: Nighttime Lighting during Construction. Nighttime lighting would affect Merced and Fresno urban areas. Under NEPA, construction impacts were determined to be of negligible intensity.	**VQ-MM#2: Minimize Light Disturbance During Construction.** Where construction lighting will be required during nighttime construction, shield such lighting and direct it downward in such a manner that the light source is not visible offsite, and so that the light does not fall outside the boundaries of the project site to avoid light spillage offsite.	**Implementing Party:** Contractor **Monitoring/Reporting Party:** Mitigation Manager to verify compliance during construction.	X	X			Construction/Weekly reporting	Contract Requirements/ Specifications

APPENDIX A

Project Design Features

This section includes project design features, as of September 2012, that are incorporated into, and considered a part of, the Selected Alternative[4] for the Merced to Fresno Section of the California HST System, described generally in Chapter 2 of the Merced to Fresno Section Project EIR/EIS (referred to hereafter as the Draft or Final EIS). These design features are organized by the Final EIS resource topics and include design features described in the Final EIS chapters, as modified by the Errata (see Appendix E of the Record of Decision).

1.0 Transportation Design Features

During project design and construction, the California High-Speed Rail Authority (Authority) and Federal Railroad Administration (FRA) will implement the following design features to reduce impacts on transportation.

1. **Off-Street Parking for Construction-Related Vehicles**. Provide adequate off-street parking for all construction-related vehicles throughout the construction period. If adequate parking cannot be provided on the construction sites, designate a remote parking area and use a shuttle bus to transfer construction workers to the job site.

2. **Maintenance of Pedestrian Access.** Prepare specific construction management plans to address maintenance of pedestrian access during the construction period. Pedestrian access-limiting actions will include, but not be limited to, sidewalk closures, bridge closures, crosswalk closures or pedestrian rerouting at intersections, placement of construction-related material within pedestrian pathways or sidewalks, and other actions that may affect the mobility or safety of pedestrians during the construction period. If sidewalks are maintained along the construction site frontage, provide covered walkways. Pedestrian access should be maintained unless maintaining access will be unsafe for pedestrians.

3. **Maintenance of Bicycle Access.** Prepare specific construction management plans to address maintenance of bicycle access during the construction period. Bicycle access-limiting actions will include, but not be limited to, bike lane closures or narrowing, closure or narrowing of streets that are designated bike routes, bridge closures, placement of construction-related materials within designated bike lanes or along bike routes, and other actions that may affect the mobility or safety of bicyclists during the construction period. Bicycle access should be maintained unless maintaining access will be unsafe for bicyclists.

4. **Restriction on Construction Hours.** Construction activities, such as material deliveries and construction employees arriving and departing the site, will generally occur outside peak periods of travel on weekdays in areas that experience congestion during those hours.

5. **Construction Truck Routes.** Deliver all construction-related equipment and materials on the local- government-designated truck routes. Prohibit heavy construction vehicles from accessing the site via other routes.

6. **Protection of Public Roadways and Railways (freight and passenger rail) during Construction.** Repair any structural damage to public roadways and railways (freight and passenger rail), returning any damaged sections to their original structural condition. Survey the condition of the public roadways along truck routes providing access to the proposed project site both before construction and after construction is complete. For railways, a "shoofly" track will be constructed within the right-of-way, where necessary, to allow existing train lines to bypass any areas closed for construction activities. Upon completion, tracks will be opened and repaired; or new mainline track will be constructed, and the "shoofly" will be removed. Complete a before-

[4] The Selected Alternative includes the Hybrid Alternative, Merced Downtown Station, and Fresno Mariposa Street Station Alternative, as described in the Record of Decision and Chapter 2 of the Merced to Fresno Section Final EIR/EIS.

and-after survey report and submit to the Authority for review, indicating the location and extent of any damage.

7. **Maintenance of Public Transit Access and Routes.** Coordinate with the appropriate transit jurisdiction before limiting access to public transit or limiting movement of public transit vehicles. Potential actions that will affect access to transit include, but are not limited to, relocating or removing bus stops, limiting access to bus stops or transfer facilities, or otherwise restricting or constraining public transit operations. Public transit access and routing will be maintained where feasible.

8. **Construction Transportation Plan.** The design-builder will prepare a detailed construction transportation plan for the purpose of minimizing the impact of construction and construction traffic on adjoining and nearby roadways. The construction transportation plan will be prepared in close consultation with the pertinent city or county, and will be reviewed and approved by the Authority prior to commencing any construction activities. This plan will address in detail the activities to be carried out in each construction phase, with the requirement of maintaining traffic flow during peak travel periods. Such activities include, but are not limited to, the routing and scheduling of materials deliveries, materials staging and storage areas, construction employee arrival and departure schedules, employee parking locations, and temporary road closures, if any. The plan will provide traffic controls pursuant to the *California Manual on Uniform Traffic Control Devices*[5] sections on temporary traffic controls and will include a traffic control plan that includes, at minimum, the following elements:

   - Temporary signage to alert drivers and pedestrians to the construction zone.
   - Flag persons or other methods of traffic control.
   - Traffic speed limitations in the construction zone.
   - Temporary road closures and provisions for alternative access during the closure.
   - Detour provisions for temporary road closures. Alternating one-way traffic will be considered as an alternative to temporary closures where practical and where it will result in better traffic flow than a detour.
   - Identified routes for construction traffic.
   - Provisions for safe pedestrian and bicycle passage, or convenient detour.
   - Provisions to minimize access disruption to residents, businesses, customers, delivery vehicles, and buses to the extent practical. Where road closures are required during construction, limit to the hours that are least disruptive to access for the adjacent land uses.
   - Provisions for farm equipment access.
   - Provisions for 24-hour access by emergency vehicles.
   - Safe vehicular and pedestrian access to local businesses and residences during construction. The plan will provide for scheduled transit access where construction will otherwise impede such access. Where an existing bus stop is within the work zone, the design-builder will provide a temporary bus stop at a convenient location away from where construction is occurring. Adequate measures will be taken to separate students and parents walking to and from the temporary bus stop from the construction zone.

[5] California Department of Transportation (Caltrans). 2012. *California Manual on Uniform Traffic Control Devices.*

- Advance notification to the local school district of construction activities and rigorously maintained traffic control at all school bus loading zones, to ensure the safety of school children

- Project Design Features 1-7 and 9-10.

9. Construction during Special Events. Provide a mechanism to prevent roadway construction activities from reducing roadway capacity below pre-project capacity during major athletic events or other special events that attract a substantial number of visitors. Mechanisms to maintain roadway capacity include police officers directing traffic, special event parking, and use of traffic cones and within-the-curb parking or shoulder lanes for through traffic.

10. Additional Features in the Cities of Merced and Fresno. In addition to the measures listed above, the Authority will also perform the following in the cities of Merced and Fresno:

- During construction, vehicle detection will be maintained on the existing, temporary, or new roadway alignment for all intersection approaches that have existing detection.

- Changeable message signs (CMSs) will be employed to advise motorists of lane closures or detours ahead. The CMSs will be deployed 7 days prior to the start of construction at that location.

- Where project construction will cause delays on major roadways during the construction period, the Selected Alternative will provide for a network of CMS locations to provide adequate driver notification. For example, construction-related delays at the railroad grade separations that lead to State Route (SR) 99 freeway interchanges will require CMS placement to the east to allow drivers to make alternate route decisions. In the case of work on Shaw Avenue in Fresno, recommended placement will be a CMS at Shaw Avenue just east of SR 41 and a CMS at Shaw Avenue just east of Palm Avenue. Similar CMS usage will be required along Ashlan Avenue, Clinton Avenue, McKinley Avenue, Olive Avenue, and Belmont Avenue.

- The Authority, in conjunction with the City of Fresno Public Works Department and the City of Merced, will develop a traffic management plan on the surface transportation network to ensure minimum public safety service levels.

- During project construction, the alignment of roadways will be grade-separated and freeway overpasses to be reconstructed will be offset from the existing alignment to facilitate staged construction wherever possible.

- In Fresno in particular, Clinton Avenue over SR 99 and Ashlan Avenue over UPRR will be offset from their existing alignments to allow for the existing roadway to remain open while the new structure is being built. This type of staging may necessitate temporary ramps to and from SR 99 during various phases of construction. Four travel lanes will be maintained from 7 a.m. to 9 a.m. and from 4 p.m. to 6 p.m. on Shaw Avenue from Cornelia to Blythe Avenue (at UPRR), on Ashlan Avenue from Parkway to Valentine Avenue (at UPRR), and on Clinton Avenue from Marks Avenue to Weber Avenue (at SR 99).

- The Veterans Boulevard overpass and construction of new alignments of Golden State Boulevard and Bullard Avenue will be completed and open to traffic prior to the closure of the Carnegie Avenue at grade railroad crossing.

- During any Belmont Avenue closures that are determined to be necessary, the adjacent crossings of Olive Avenue and Divisadero Street will remain open with no lane closures at the two crossings.

- With regard to the existing railroad crossings at Divisadero, Tuolumne, and Stanislaus streets, two of the three crossings will remain open during construction.

2.0 Air Quality and Global Climate Change Design Features

During project design and construction, the Authority and FRA will implement the following design features to reduce impacts on air quality:

- Trucks will be covered to reduce significant fugitive dust emissions while hauling soil and other similar material.
- All trucks and equipment will be washed before exiting the construction site.
- Exposed surfaces and unpaved roads will be watered three times daily.
- Vehicle travel speed on unpaved roads will be reduced to 15 miles per hour (mph).
- Any dust-generating activities will be suspended when wind speed exceeds 25 mph.
- All disturbed areas, including storage piles, that are not being actively used for construction purposes will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover.
- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled for fugitive dust emissions by an application of water or by presoaking. With the demolition of buildings up to six stories in height, all exterior surfaces of the buildings will be wetted during demolition.
- All materials transported offsite will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, piles will be effectively stabilized for fugitive dust emissions using sufficient water or a chemical stabilizer/suppressant.
- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day will prevent carryout and trackout.
- Use of low-volatile organic compound (VOC) paint that contains less than 10% of VOC contents. (VOC, 10%). A Super-compliant or Clean Air paint that has a lower VOC content than those required by South Coast Air Quality Monitoring District Rule 1113, will also be used when available.

3.0 Noise and Vibration Design Features

During construction, the Authority will follow FRA and Federal Transit Administration (FTA) guidelines for minimizing noise and vibration impacts at sensitive receptors.

4.0 Electromagnetic Fields/ Electromagnetic Interference Design Features

The California HST Project will comply with applicable federal and state laws and regulations related to electromagnetic fields/electromagnetic interference (EMF/EMI). Project design includes an electromagnetic compatibility program plan (EMCPP), which provides for electromagnetic compatibility of HST equipment and facilities with themselves, with equipment and facilities of the HST's neighbors, and with passengers, workers, and neighbors of the HST. The EMCPP also will guide and coordinate the EMC design, analysis, test, documentation, and certification activities among HST project management, systems, and sections through the project phases; conform with the EMC-related HST system requirements; and comply with applicable regulatory requirements, including EMC requirements in Title 49 Code of Federal Regulations (C.F.R.) Sections 200–299 for the HST systems and sections will follow the EMCPP to avoid EMF/EMI conflicts with HST operational safety.

5.0 Public Utilities/Energy Design Features

The project design incorporates precautions to avoid existing utilities and design elements that minimize electricity consumption (e.g., using regenerative braking, and energy saving equipment and facilities).

To enhance the benefits of the HST, the Authority has set a goal to procure renewable electricity to provide power for HST operations. The Authority is a member of the Sustainability Partnership with FRA, the U.S. Department of Housing and Urban Development (Region 9), FTA (Region 9), and the U.S. Environmental Protection Agency (EPA) (Region 9), established by a memorandum of understanding (MOU). The MOU serves as an umbrella agreement covering broad efforts to promote sustainability for the HST System, including implementing the renewable energy policy goal for HST operations. The Authority accessed technical assistance from the Department of Energy's National Renewable Energy Laboratory through the EPA as part of this partnership. The laboratory developed a strategic energy plan that provides signatory agencies and the Authority with guidelines to meet the goals established in the MOU. The plan recommended a net-zero approach to powering operations with 100% renewable energy. HST Project buildings will conform to U.S. Green Building Council Leadership in Energy and Environmental Design (i.e., LEED) rating standards for environmentally sustainable new construction; HST facilities, including HST stations and a heavy maintenance facility (HMF), will be certified, at minimum, at the Silver Level, and will be required to meet or exceed energy efficiency targets with the goal of zero net energy use for facilities. Achieving the Authority's policy goal of using up to 100% renewable energy sources for the HST System would result in a total estimated reduction in fossil fuel energy resources for the HST System of up to 12.7 million barrels of oil annually by 2030.[6]

[6] Authority. 2008. *The Use of Renewable Energy Sources to Provide Power to California's High Speed Rail*. Prepared by Navigant Consulting, Inc. Rancho Cordova, CA. September 3, 2008.

4.0 Biological Resources Design Features

The Selected Alternative includes project design features such as those that minimize effects from crossing the San Joaquin River, effectively manage and reduce runoff and discharges, and facilitate wildlife movement.

4.1 Project Design Options for the San Joaquin River

A program-level environmental document (Draft Program EIS/EIR for the San Joaquin River Restoration Program[7]) for the San Joaquin River Remediation Project (SJRRP) has been prepared. The location of the project crossing is in Reach 1, which has been identified as the reach where spawning may occur. During an initial coordination meeting with Bureau of Reclamation (Reclamation) and the Department of Water Resources (DWR) on June 6, 2011, it was determined that the project design will not conflict with the SJRRP; however, this will be further evaluated as part of the permitting process, including Endangered Species Act Section 7 consultation with the National Marine Fisheries Service (NMFS). The Authority will continue to coordinate with the SJRRP.

Since the release of the Merced to Fresno Section Draft EIS, additional coordination has occurred under Section 7 of the Federal Endangered Species Act with the USFWS and NMFS for the preparation and submittal of the Biological Assessments. This coordination, particularly with NMFS, has resulted in two project design options for the crossing of the San Joaquin River.

- One design option for the river crossing utilizes a continuation (as on upland areas) of the spacing of the columns of the elevated structure as it approaches the river crossing within the inundated river channel. The proposed configuration or span arrangement utilizes piers/foundations at a spacing of 110 feet and results in the placement of three piers within the wetted perimeter of the typical low flow channel of the river. Construction will require work in the river channel for placement of the piers.

- A second design option has a configuration that uses a combination of the typical precast segmental construction up to the north bank of the river with a two-span (320- to 160-foot) steel truss superstructure spanning the main portion of the low flow channel. This second design minimizes the need to enter the wetted perimeter of the low-flow river channel. Construction will require temporary work in the river channel, including for placement of temporary piers.

As required, the construction of foundations within the edge of the active waterway will use construction methods such as the installation of sheet pile cofferdams to isolate the activity from the water column to minimize the potential for adverse effects on anadromous fish within the construction footprint. In addition, for the installation of both temporary and permanent steel casings for cast-in-drilled-hole pile construction, sheet piling for cofferdams, and pipe or H-piling for falsework, vibratory pile hammers will be used to minimize underwater acoustic impacts.

The number of foundation elements is directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Since the future crossing will be located upstream from the two existing bridge structures that carry SR 99 and the UPRR, the hydraulic effect of the placement of new piers within the river corridor on downstream structures and the geomorphology of the channel will be considered during the design of the final configuration of the structure. The HST crossing will be designed with the planned increase in river flows and will not conflict with the goals of the restoration flows.

[7] Reclamation and DWR. 2011. *Draft Program Environmental Impact Statement/Environmental Impact Report for the San Joaquin River Restoration Program, California – Executive Summary*. April 2011.

Regardless of the design option, the HST crossing will be designed with due consideration for the anticipated increases in river flows resulting from the implementation of the SJRRP and to minimize any appreciable changes in scour, sediment transport and deposition, or changes in geomorphic processes that could alter habitat conditions in a manner that will impede the reestablishment of these species. The Authority, in partnership with the design-build team, will design and conduct a hydraulics/hydrology analysis with appropriate modeling tools and incorporate site-specific data including the needed geotechnical investigations, to establish the design requirements, including sizing and siting of features as well as construction techniques, that are compatible with habitat conditions that support salmonid utilization of the San Joaquin River within the area affected by the proposed HST crossing.

The design will be evaluated in consultation with NMFS, the California Department of Fish and Game, Reclamation, and the U.S. Army Corps of Engineers (USACE).

4.2 Project Design Features for Stormwater Management and Treatment

During the detailed design phase, the design-build team will evaluate each receiving stormwater system's capacity to accommodate project runoff. As necessary, this phase will include the following:

- Design onsite stormwater management measures, such as detention or selected upgrades to the receiving system, to provide adequate capacity.
- Design and construct onsite stormwater management facilities to capture runoff and provide treatment prior to discharge for pollutant-generating surfaces, including station parking areas, access roads, new road overpasses and underpasses, reconstructed interchanges, and new or relocated roads and highways.
- Consider the use of constructed wetland systems, biofiltration and bioretention systems, wet ponds, organic mulch layers, planting soil beds, and vegetated systems (biofilters) such as vegetated swales and grass filter strips.
- Use portions of the HMF site for onsite infiltration of runoff, if feasible, or for stormwater detention if not. Incorporate vegetated setbacks from streams.

4.3 Project Design Features for Flood Protection

Design of the Selected Alternative will allow the HST to remain operational during flood events and will minimize increases in 100-year flood elevations, including the following:

- In Special Flood Hazard Areas, raise the track at least 4 feet above the 100-year flood elevation.
- Minimize development within the floodplain as appropriate. Avoid placement of facilities in the floodplain (e.g., at the Castle Commerce Center HMF site and the Gordon-Shaw HMF) or raise the ground with fill above the base-flood elevation.

Crossing design will maintain a floodwater surface elevation of no greater than 0.1 foot above current levels (zero rise within designated floodways). The following design considerations will minimize the effects of pier placement in the floodways:

- Design site crossings to be as nearly perpendicular to the channel as feasible to minimize bridge length.
- Orient piers to be parallel to the expected high water flow direction to minimize flow disturbance.

- Elevate bridge crossings at least 3 feet above the high water surface elevation to provide adequate clearance for floating debris or as required by local agencies. (The Central Valley Flood Protection Board requires that the bottom members [soffit] of a proposed bridge be at least 3 feet above the calculated water surface elevation for the design flood. The required clearance may be reduced to 2 feet on minor streams at sites where significant amounts of stream debris are unlikely.)

- Conduct engineering analyses of channel scour depths at each crossing to evaluate the necessary embedment depth for bridge piers. Implement scour-control measures to reduce erosion potential.

- Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complemented with native riparian plantings or other natural stabilization alternatives that will restore and maintain a natural riparian corridor, where feasible.

- Place bedding materials under stone protection at locations where the underlying soils require stabilization resulting from streamflow velocity.

4.4 Construction Stormwater Pollution Prevention Plan

The State Water Resources Control Board (SWRCB) Construction General Permit (2009-0009-DWQ)[8] establishes three erosion risk levels that are based on site erosion and receiving-water risk factors. A preliminary analysis indicates that most of the Selected Alternative will fall under Erosion Risk Level 1, the lowest risk level. The portion of the project vicinity draining to the San Joaquin River will fall under Erosion Risk Level 2. Erosion Risk Level 2 measures also will be carried out anywhere in the project vicinity where construction activities are conducted within or immediately adjacent to sensitive environmental areas such as streams, wetlands, and vernal pools.

The Construction General Permit requires preparation and implementation of a stormwater pollution prevention plan (SWPPP), which will identify best management practices (BMPs) to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. These BMPs could include measures to provide permeable surfaces where feasible and to retain and treat stormwater on site. Other BMPs include strategies to manage the overall amount and quality of stormwater runoff. Typical BMPs include:

- Practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.

- Limiting fueling and other activities using hazardous materials to areas distant from surface water, providing drip pans under equipment, and daily checks for vehicle condition.

- Practices to reduce erosion of exposed soil, including soil stabilization, watering for dust control, perimeter silt fences, placement of rice straw bales, and sediment basins.

- Practices to maintain water quality including silt fences, stabilized construction entrances, grass buffer strips, ponding areas, organic mulch layers, inlet protection, and Baker tanks and sediment traps to settle sediment.

[8] SWRCB. 2009.*National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges associated with Construction and Land Disturbance Activities. Order No. 2009-0009-DWQ*. Adopted September 2, 2009. Sacramento, CA. Available at
http://www.swrcb.ca.gov/board_decisions/adopted_orders/water_quality/2009/wqo/wqo2009_0009_dwq.pdf.
Accessed September 6, 2010.

- Practices to capture and provide proper offsite disposal of concrete washwater, including isolation of runoff from fresh concrete during curing to prevent it from reaching the local drainage system, and possible treatment with dry ice or other acceptable means to reduce the alkaline character of the runoff (high pH) that typically results from new concrete.
- Development of a spill prevention and emergency response plan to manage potential fuel or other spills.
- Use of diversion ditches to intercept offsite surface runoff.
- Where feasible, avoidance of areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.
- Where feasible, limiting construction to dry periods when flows in water bodies are low or absent.

4.5 Central Valley Regional Water Quality Board, Order No. 5-00-175, Waste Discharge Requirements General Order for Dewatering and Other Low Threat Discharges to Surface Waters

This order is a permit that covers construction dewatering discharges and some other listed discharges that do not contain significant quantities of pollutants, and that either: (1) are 4 months or less in duration, or (2) have an average dry-weather discharge that does not exceed 0.25 million gallons per day.

4.6 Maintain Pre-Project Hydrology

Avoid increasing existing peak stormwater flows from the project site. This will be accomplished by emphasizing onsite retention of stormwater runoff using measures such as flow dispersion, infiltration, and evaporation, supplemented by detention, where required. Additional flow control measures could be implemented where local regulations or drainage requirements dictate.

4.7 Industrial Stormwater Pollution Prevention Plan

The stormwater general permit (97-03-DWQ)[9] requires the preparation of an SWPPP and a monitoring plan for industrial facilities, including vehicle maintenance facilities associated with transportation operations. The permit includes performance standards for pollution control.

4.8 Air Quality Fugitive Dust Control

Fugitive dust control measures are administered through Rule 8011. According to Rule 8011, the San Joaquin Valley Air Pollution Control District requires the implementation of control measures for fugitive dust emission sources. These measures are not considered mitigation measures because they are required by law.

[9] State Water Resources Control Board (SWRCB). 2000. *Water Quality Order No. 97-03-DWQ National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000001 (General Permit). Waste Discharge Requirements (WDRS) for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities*. Sacramento, CA. Available at http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/induspmt.pdf.

4.9 Wildlife-dedicated Crossings

Crossing structures dedicated to facilitating wildlife movement will be included in the design, as discussed in Chapter 2 of the Final EIS.

5.0 Hydrology and Water Quality Design Features

During project design and construction, the Authority will ensure the measures outlined below are implemented to reduce and avoid impacts on water resources as discussed in the Final EIS Section 3.8.5, Environmental Consequences. Appendix C of the Merced to Fresno Section Hydraulics and Floodplain Technical Report[10] provides a matrix that lists relevant standards and regulations for these impacts. These measures and standards are discussed in greater detail in support documents prepared for the preliminary design, including the following:

- HST *Technical Memorandum 2.6.5, Hydraulics and Hydrology Design Guidelines.*[11]
- *Hydraulics and Floodplain Technical Report, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*[12] (project-wide, and for Construction Package 1A).
- *Merced to Fresno Section Stormwater Management Plan, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*[13] (project-wide, and for Construction Package 1A).

These measures are considered to be part of the Selected Alternative and are described in the following text. Additionally, the Selected Alternative will require an Individual Section 404 Permit from USACE. This permit will have conditions to further minimize water quality impacts.

5.1 Project Design Features for Stormwater Management and Treatment

During the detailed design phase, evaluate each receiving stormwater system's capacity to accommodate project runoff. As necessary, design onsite stormwater management measures, such as detention or selected upgrades to the receiving system, to provide adequate capacity. Design and construct onsite stormwater management facilities to capture runoff and provide treatment prior to discharge for pollutant-generating surfaces, including station parking areas, access roads, new road overpasses and underpasses, reconstructed interchanges, and new or relocated roads and highways. Use low-impact development techniques to retain runoff onsite and to reduce offsite runoff, to the extent practical. Consider the use of constructed wetland systems, biofiltration and bioretention systems, wet ponds, organic mulch layers, planting soil beds, and vegetated systems (biofilters) such as vegetated swales and grass filter strips. Use portions of the HMF site for onsite infiltration of runoff, if feasible, or for stormwater detention, if not. Incorporate vegetated set-backs from streams, such as Canal Creek and Berenda Creek.

[10] Authority and FRA. 2012. *Hydraulics and Floodplain Technical Report, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*. Prepared by AECOM and CH2M HILL. Sacramento, CA, and Washington, DC. April 2012.

[11] Authority. 2010. Technical Memorandum 2.6.5, *Hydraulics and Hydrology Design Guidelines*. Available at http://www.cahighspeedrail.ca.gov/. Prepared by Parsons Brinckerhoff. Sacramento, CA. June 10, 2010.

[12] Authority and FRA. 2012. *Hydraulics and Floodplain Technical Report, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*. Prepared by AECOM and CH2M HILL. Sacramento, CA, and Washington, DC. April 2012.

[13] Authority and FRA. 2012. *Stormwater Management Plan, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*. Sacramento, CA. April 2012.

5.2 Project Design Features for Flood Protection

Design the Selected Alternative, both to remain operational during flood events and to minimize increases in 100-year flood elevations, including the following:

- Establish track elevation to prevent saturation and infiltration of stormwater into the sub-ballast. During the design storm, maintain 2 feet of freeboard between the sub-ballast and the water surface elevation.
- Minimize development within the floodplain as appropriate. Avoid placement of facilities in the floodplain (e.g., at the Castle Commerce Center HMF site or the Gordon-Shaw HMF site) or raise the ground with fill above the base-flood elevation.

Design of the crossings will maintain a floodwater surface elevation of no greater than 0.1 foot above current levels (zero rise within designated floodways). The following design considerations will minimize the effects of pier placement in the floodways:

- Design site crossings to be as nearly perpendicular to the channel as feasible to minimize bridge length.
- Orient piers to be parallel to the expected high water flow direction to minimize flow disturbance.
- Elevate bridge crossings at least 3 feet above the high water surface elevation to provide adequate clearance for floating debris or as required by local agencies. (The Central Valley Flood Protection Board [CVFPB] requires that the bottom members [soffit] of a proposed bridge be at least 3 feet above the design floodplain. The required clearance may be reduced to 2 feet on minor streams at sites where significant amounts of stream debris are unlikely.)
- Conduct engineering analyses of channel scour depths at each crossing to evaluate the depth for burying the bridge piers and abutments. Implement scour-control measures to reduce erosion potential.
- Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complemented with native riparian plantings or other natural stabilization alternatives that will restore and maintain a natural riparian corridor, where feasible.
- Place bedding materials under the stone protection at locations where the underlying soils require stabilization resulting from streamflow velocity.

5.3 Construction Stormwater Pollution Prevention Plan

The SWRCB Construction General Permit (Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System [NPDES] No. CAS000002) establishes three erosion risk levels that are based on site erosion and receiving-water risk factors. A preliminary analysis indicates that most of the Selected Alternative will fall under Erosion Risk Level 1, the lowest risk level. The portion of the project vicinity draining to the San Joaquin River will fall under Erosion Risk Level 2. Erosion Risk Level 2 measures also will be carried out anywhere in the project vicinity where construction activities are conducted within or immediately adjacent to sensitive environmental areas such as streams, wetlands, and vernal pools.

The Construction General Permit requires preparation and implementation of an SWPPP, which will provide BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. These BMPs could include measures to provide permeable surfaces where feasible and to retain and treat stormwater onsite. Other BMPs include strategies to manage the overall amount and quality of stormwater runoff. The construction SWPPP will include measures to address the following:

- Hydromodification management to ensure maintenance of pre-project hydrology by emphasizing onsite retention of stormwater runoff using measures such as flow dispersion, infiltration, and evaporation, supplemented by detention, where required. Additional flow control measures could be implemented where local regulations or drainage requirements dictate.
- Practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.
- Limiting fueling and other activities using hazardous materials to areas distant from surface water, providing drip pans under equipment, and daily checks for vehicle condition.
- Practices to reduce erosion of exposed soil, including soil stabilization, watering for dust control, perimeter silt fences, placement of rice straw bales, and sediment basins.
- Practices to maintain water quality including silt fences, stabilized construction entrances, grass buffer strips, ponding areas, organic mulch layers, inlet protection, and Baker tanks and sediment traps to settle sediment.
- Practices to capture and provide proper offsite disposal of concrete washwater, including isolation of runoff from fresh concrete during curing to prevent it from reaching the local drainage system, and possible treatment with dry ice or other acceptable means to reduce the alkaline character of the runoff (high pH) that typically results from new concrete.
- Development of a spill prevention and emergency response plan to handle potential fuel or other spills.
- Use of diversion ditches to intercept offsite surface runoff.
- Where feasible, avoidance of areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.
- Where feasible, limit construction to dry periods when flows in water bodies are low or absent.

5.4 Central Valley Regional Water Quality Board, Order No. 5-00-175 (NPDES No. CAG995001), Waste Discharge Requirements General Order for Dewatering and Other Low Threat Discharges to Surface Waters

This order is a permit that covers construction dewatering discharges and some other listed discharges that do not contain significant quantities of pollutants, and that either (1) are 4 months or less in duration, or (2) have an average dry-weather discharge that does not exceed 0.25 million gallons per day.

The CVFPB regulates specific river, creek, and slough crossings for flood protection. These crossings must meet the provisions of Title 23 of the California Code of Regulations. Title 23 requires that new crossings maintain hydraulic capacity through such measures as in-line piers, adequate streambank height (freeboard), and measures to protect against streambank and channel erosion. Section 208.10 requires that improvements, including crossings, be constructed in a manner that does not reduce the channel's capacity or functionality, or that of any federal flood control project. The CVFPB reviews encroachment permit applications for approval of a new channel crossing or other channel modification. For a proposed crossing or placement of a structure near a federal flood control project, the CVFPB coordinates review of the encroachment permit application with USACE pursuant to assurance agreements with USACE and the

USACE operation and maintenance manuals under Title 33 C.F.R., Section 208.10 and Title 33 United States Code, Section 408. Under Section 408 of the Rivers and Harbors Act, USACE must approve any proposed modification that involves a federal flood control project. A Section 408 permit would be required if construction modifies a federal levee. A Section 208.10 permit would be required where the Selected Alternative encroaches on a federal facility but does not modify it.

Industrial Stormwater Pollution Prevention Plan. The stormwater general permit (Order No. 97-03-DWQ, NPDES No. CAS000001) requires preparation of an SWPPP and a monitoring plan for industrial facilities, including vehicle maintenance facilities associated with transportation operations. The permit includes performance standards for pollution control. The HMF will meet the stormwater treatment requirements of the Industrial General Permit.

6.0 Geology, Soils, and Seismicity Design Features

Project design will incorporate existing design measures and BMPs based on federal and state regulations and based on the Program EIR/EIS documents. Table 5-1 in the Merced to Fresno Section Geology and Soils Technical Report[14] provides a matrix that lists relevant standards and regulations for the impacts identified in the Final EIS Section 3.9.5, Environmental Consequences. Site-specific explorations will be carried out as design work progresses so that the Authority can incorporate site-specific engineering solutions that adhere to standard engineering design practices and codes into the design to reduce risks associated with geology, soils, and seismicity. Versions of the standard engineering design guidelines and standards applicable at the time this document was prepared (2011) are described below; the versions of these guidelines and standards applicable at the time of final design and construction will be used:

- **American Association of State Highway and Transportation Officials (AASHTO) Manuals:** 2010 AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications (5th Edition)[15] and the 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design16 provide guidance for characterization of soils, as well as methods to be used in the design of bridge foundations and structures, retained cuts and retained fills, at-grade segments, and buried structures. These design specifications will provide minimum specifications for evaluating the seismic response of the soil and structures.

- **Federal Highway Administration Circulars and Reference Manuals:** These documents provide detailed guidance on the characterization of geotechnical conditions at sites, methods for performing foundation design, and recommendations on foundation construction. These guidance documents include methods for designing retaining walls used for retained cuts and retained fills, foundations for elevated structures, and at-grade segments. Some of the documents include guidance on methods of mitigating geologic hazards that are encountered during design.

- **American Railway Engineering and Maintenance-of-Way Association Manual:** These guidelines deal with rail systems. Although they cover many of the same general topics as AASHTO, they are more focused on best practices for rail systems. The manual includes principles, data, specifications, plans, and economics pertaining to the engineering, design, and construction of railways.[17]

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[14] Authority and FRA. 2012. *Geology, Soils, and Seismicity Technical Report, Merced to Fresno Section Project EIR/EIS*. April 2012.

[15] AASHTO. 2010. *2010 AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications (5th Edition).* Washington, DC.

[16] AASHTO. 2009. *2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design*. Washington, DC.

[17] American Railway Engineering and Maintenance-of-Way Association. 2009. *Manual for Railway Engineering*. January 1, 2009.

- **California Building Code (CBC):** The CBC is based on the 2006 International Building Code (IBC). This code contains general building design and construction requirements relating to fire and life safety, structural safety, and access compliance.
- **IBC and American Society of Civil Engineers (ASCE)-7:** These codes and standards provide minimum design loads for buildings and other structures. They will be used for the design of the maintenance facilities and stations. Sections in the IBC and ASCE-7 provide minimum requirements for geotechnical investigations, levels of earthquake ground shaking, minimum standards for structural design, and inspection and testing requirements.[18,19]
- **Caltrans Design Standards:** Caltrans has specific minimum design and construction standards for all aspects of transportation system design, ranging from geotechnical explorations to construction practices. Caltrans design standards include state-specific amendments to the AASHTO LRFD Bridge Design Specifications[20] and Guide Specifications for LRFD Seismic Bridge Design.[21] These amendments provide specific guidance for the design of deep foundations used to support elevated structures, for design of mechanically stabilized earth walls used for retained fills, and for design of various types of cantilever (e.g., soldier pile, secant pile, and tangent pile) and tie-back walls used for retained cuts.
- **ASTM International (ASTM):** ASTM has developed standards and guidelines for all types of material testing, from soil compaction testing to concrete strength testing. The ASTM standards also include minimum performance requirements for materials. Most of the guidelines and standards cited above use ASTM or a corresponding series of standards from AASHTO so that quality is achieved in the constructed project.[22]

To manage geologic, soils, and seismic hazards, projects implement specific design measures to reduce and avoid impacts during construction and operation. These practices include the following:

- **Limit Groundwater Withdrawal:** Control the amount of groundwater withdrawal, re-inject groundwater at specific locations, or use alternate foundations to offset the potential for settlement. This control is important for locations with retained cuts in areas of high groundwater and where existing buildings are located near the depressed track section.
- **Monitor Slopes:** Incorporate slope monitoring into final design where a potential for long-term instability exists from gravity or seismic loading. This practice is important near at-grade sections where slope failure could result in loss of track support or where slope failure could result in additional earth loading to foundations supporting elevated structures.
- **Suspend Operations before and after Earthquake:** Use motion-sensing instruments to provide ground-motion data; implement a control system to shut down HST operations temporarily during or after an earthquake to reduce risks. Monitoring is appropriate for any location where high ground motions could damage the HST track system. Candidate locations include elevated guideways, retained earth, retained cut, and at-grade segments.

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18 IBC. 2006. *2006 International Building Code (IBC)*. Washington, DC.

19 ASCE. 2010. *Minimum Design Loads for Buildings and Other Structures ASCE 7-10*. May 12, 2010.

20 AASHTO. 2010. *2010 AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications (5th Edition).* Washington, DC.

21 AASHTO. 2009. *2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design*. Washington, DC.

22 ASTM. 2012. *Annual Book of ASTM Standards. Volume 4.02 Concrete and Aggregate; Volume 4.08 Soil and Rock; Volume 4.09 Soil and Rock II; Volume 4.03 Geosynthetics*. West Conshohocken, PA.

- **Conduct Geotechnical Inspections:** Prior to and throughout construction, conduct geotechnical inspections to verify that no new, unanticipated conditions are encountered and to determine the locations of unstable soils in need of improvement.

- **Improve Unstable Soils:** For unstable soils the risk of ground failure can be minimized or avoided by various methods. If the soft or loose soils are shallow, they can be excavated and replaced with competent soils. Where unsuitable soils are deeper, ground improvement methods such as stone columns, cement deep soil mixing (CDSM), or jet grouting could be used. Alternately, if sufficient construction time is available, preloading in combination with prefabricated vertical drains (wicks) and staged construction can be used to gradually improve the strength of the soil without causing bearing capacity failures. Both over-excavation and ground improvement methods have been successfully used to improve similar soft or loose soils. The application of these methods is most likely at stream and river crossings, where soft soils could occur; however, localized deposits could occur at other locations along the alignment. The ground improvement or over-excavation methods may also be necessary at the start of approach fills for elevated track sections or retained earth segments of the alignment if the earth loads exceed the bearing capacity of the soil. Alternately, at these locations earth fills might be replaced by light-weight fill such as extruded polystyrene (geofoam), or short columns and cast-in-drill hole (CIDH) piles might be used to support the transition from the elevated track to the at-grade alignment.

- **Improve Settlement-Prone Soils:** Settlement-prone soils are improved prior to facility construction. Ground improvement is used to transfer new earth loads to deeper, more competent soils. Another alternative is to use preloads and surcharges with wick drains to accelerate settlement within areas that are predicted to undergo excessive settlement. By using the preload and surcharge with wick drains, settlement would be forced to occur. The application of these methods is most likely at stream and river crossings, where soft soils are more likely to occur. Where groundwater is potentially within 50 feet of the ground surface, any below-ground excavations use well points in combination with sheetpile walls to limit the amount of settlement of adjacent properties from temporary water drawdown. Alternately, water can be re-injected to make up for localized water withdrawal.

- **Prevent Water and Wind Erosion:** Many engineering methods exist for controlling water and wind erosion of soils. These include use of straw bales and mulches, revegetation, and covering areas with geotextiles. Where the rate of water runoff could be high, rip rap and rip rap check dams could be used to slow down the rate of water runoffs. Other BMPs for water are discussed in the Final EIS Section 3.8, Hydrology and Water Resources. Implementation of these methods is important where large sections of earth is exposed during construction, such as for retained-cut segments.

- **Modify or Remove and Replace Soils with Shrink-Swell Potential and Corrosion Characteristics:** One option is to excavate and replace soils that represent the highest risk. In locations where shrink-swell potential is marginally unacceptable, soil additives would be mixed with existing soil to reduce the shrink-swell potential. The decision whether to remove or treat the soil is made on the basis of specific shrink-swell potential or corrosivity characteristics of the soil, the additional costs for treatment versus excavation and replacement, as well as the long-term performance characteristics of the treated soil. This practice is important for at-grade segments of the alignment because these are most likely to be affected by shrink-swell potential or corrosive soils.

- **Evaluate and Design for Large Seismic Ground Shaking:** Conduct detailed seismic studies to establish the most up-to-date estimation of levels of ground motion. Use updated Caltrans seismic design criteria in the design of any structures supported in or on the ground. These design procedures and features reduce the potential that moments, shear forces, and displacements that result from inertial response of the structure lead to collapse of the structure. In critical locations, pendulum base isolators can reduce the levels of inertial forces. New composite materials can enhance seismic performance.

- **Secondary Seismic Hazards:** As discussed above, various ground improvement methods can be implemented to reduce the potential for liquefaction, liquefaction-induced lateral spreading or flow of slopes, or post-earthquake settlement. Ground improvement around CIDH piles improves the lateral capacity of the CIDH during seismic loading. CDSM or jet grouting develop resistance to lateral flow or spreading of liquefied soils.

7.0 Hazardous Materials and Wastes Design Features

As part of the Selected Alternative, materials and wastes will be handled, transported, and disposed of in accordance with applicable state and federal regulations, such as the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Hazardous Materials Release Response Plans and Inventory Law, and the Hazardous Waste Control Act (see the Final EIS Section 3.3, Air Quality and Global Climate Change, for regulations applying to hazardous air pollutants). During the property acquisition process, analysis of properties acquired for construction of the HST will be conducted, including title searches and determination of which properties require further assessment for hazardous material contamination. Where current site conditions or documented past land use practices provide a reason to believe that an unusual buildup of potentially hazardous materials has occurred, the Authority will conduct a Phase 1 environmental site assessment in accordance with standard ASTM methodologies to characterize the site. The determination of which parcels require soil testing and where sampling should occur will be informed by the Phase 1 environmental site assessment and made in conjunction with state and local agency officials. Testing and appropriate remediation will be conducted prior to construction. Remediation activities may include removal of contamination, in situ treatment, or soil capping. Nominal design variances, such as the addition of a plastic barrier beneath the ballast material to limit the potential release of volatile subsurface contaminants, may be implemented in conjunction with site investigation and remediation. All work within 1,000 feet of a landfill will require methane protection measures, including gas detection systems and personnel training, pursuant to Title 27, the hazardous materials contingency plan, and BMPs.

Undocumented contamination could be encountered during construction activities and the Authority will work closely with local agencies to resolve any such conflicts. A construction management plan will be developed that will include provisions for the disturbance of undocumented contamination. In addition, demolition plans will be prepared for the safe dismantling and removal of building components and debris. The demolition plans will include a plan for lead and asbestos abatement. Further, a spill prevention, control, and countermeasures (SPCC) plan or, for smaller quantities, a spill prevention and response plan, will be implemented that prescribes BMPs to follow to clean up any hazardous material release. During operation of the HST, hazardous materials monitoring plans, such as a hazardous materials business plan and an SPCC plan, will be implemented.

To the extent feasible, the Authority is committed to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operation, and maintenance of the HST System. Moreover, the Authority will evaluate the full inventory of hazardous materials employed on an annual basis and replace hazardous substances with nonhazardous materials to the extent possible. These standards and material specifications will aid in promoting safety for passengers and employees.

Existing standards and regulations address many of the impacts identified in this analysis. Table 6-4 in the Merced to Fresno Section Hazardous Materials/Wastes Technical Report[23] provides a matrix that indicates relevant standards and regulations for these impacts.

8.0 Safety and Security Design Features

Project design will incorporate engineering measures and best management practices based on federal and state regulations and on Program EIR/EIS documents. The standard engineering design guidelines and regulatory requirements include the following:

- Final design includes development of a detailed construction transportation plan that will involve coordination with local jurisdictions on emergency vehicle access. The plan will also include a traffic control plan that addresses temporary road closures, detour provisions, allowable routes, and alternative access. Engineering design and construction phases include preliminary hazard analysis, collision hazard analysis, and threat and vulnerability assessment methods.

- Preliminary hazard analyses follow the U.S. Department of Defense System Safety Program Plan Requirements (MIL-STD-882D)[24] to identify and evaluate the facility hazards and vulnerabilities so that the design can address and either eliminate or minimize them.

- Threat and vulnerability assessments establish provisions for the deterrence and detection of, as well as the response to, criminal and terrorist acts for rail facilities and system operations. Provisions include security education and employee training specific to terrorism awareness, right-of-way fencing, intrusion detection, closed-circuit televisions, and other design features to reduce criminal and terrorist activities. Intrusion detection technology could also alert to the presence of inert objects, such as toppled tall structures or derailed freight trains, and could stop HST operations to avoid collisions.

- Construction safety and health plans (CSHPs) establish the minimum safety and health guidelines for contractors of, and visitors to, construction projects. CSHPs require contractors to develop and implement site-specific measures that address regulatory requirements to protect human health and property at construction sites.

- CSHPs establish the minimum safety and health guidelines for contractors of, and visitors to, construction projects. CSHPs require contractors to develop and implement site-specific measures that address regulatory requirements to protect human health and property at construction sites.

- Fire/life safety programs (FLSPs) implement the requirements set forth in the Federal Rail Safety Act. FLSPs address the safety of passengers and employees during emergency response. The FLSPs also address the needs of disabled persons. The FLSPs are coordinated with local emergency response organizations to provide them with an understanding of the rail system, facilities, and operations, and to obtain their input for modifications to emergency response operations and facilities, such as evacuation routes.

- System security plans address design features intended to maintain security at the stations within the track right-of-way, at stations, and onboard trains. The design standards and guidelines require emergency walkways on both sides of the tracks for both elevated and at-grade sections. Adequate space will be provided along at-grade sections of the alignment to allow emergency response access. Ground access will be available from elevated tracks where access to ground equipment is required.

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[23] Authority and FRA. 2012. *Hazardous Materials/ Wastes Technical Report, California High-Speed Train Project EIR/EIS, Merced to Fresno Section*. Prepared by AECOM, CH2M HILL, and Parus Consulting, Inc. Sacramento, CA, and Washington, DC. April 2012.

[24] U.S. Department of Defense. 2000. *Standard Practice for System Safety. MIL-STD-882D*. Washington, DC. February 10, 2000.

This ground access could be used in the event of an emergency. Additional ground access will be considered, consistent with fire and rescue procedures and where practical operational standards include a system-specific police force.

- Standard operating procedures and emergency operating procedures include industry best practices, such as the FRA-mandated Roadway Worker Protection Program. They address the day-to-day operation and emergency situations to maintain the safety of employees, passengers, and the public.
- System safety program plans (SSPPs) incorporate FRA requirements and are implemented upon FRA approval. These plans are based on the principles outlined in the *Manual for Development of System Safety Program Plans for Commuter Railroads*[25] and address project design, construction, testing, and operation.
- Rail systems must comply with the *Highway-Rail Grade Crossing Guidelines for High-Speed Passenger Rail*[26] and future safety regulations the FRA develops for high-speed passenger rail.
- Worker safety in the workplace is generally governed by the Occupational Safety and Health Act of 1970, which established the Occupational Safety and Health Administration (OSHA). The State of California, under an agreement with OSHA, operates an occupational safety and health program in accordance with Section 18 of the Occupational Safety and Health Act of 1970. In California, OSHA enforcement of workplace requirements is performed by the California Department of Industrial Relations, Division of Occupational Safety and Health (better known as Cal/OSHA). Under Cal/OSHA regulations, as of July 1, 1991, every employer in California must establish, implement, and maintain an injury and illness prevention program.
- HST urban design guidelines[27] require implementing the principles of crime prevention through environmental design. This is a design method that focuses on reducing opportunities for crime through the design and management of the physical environment. Four basic principles of crime prevention through environmental design will be considered during station and site planning: (1) territoriality (designing physical elements that express ownership of the station or site); (2) natural surveillance (arranging physical features to maximize visibility); (3) improve sightlines (provide clear views of surrounding areas); and (4) access control (physical guidance of people coming and going from a space).

9.0 Socioeconomics, Communities, and Environmental Justice Design Features

The Authority must comply with the Uniform Relocation Act in implementing the Selected Alternative. The provisions of the Uniform Relocation Act apply to all acquisitions of real property or displacements of persons resulting from federal or federally assisted programs and projects. The Uniform Relocation Act provides for the fair and equitable treatment of those displaced persons. The Uniform Relocation Act requires that the owning agency notify all affected owners of the acquiring agency's intent to acquire an interest in their property, including a written offer letter of just compensation specifically describing those property interests and assign a right-of-way specialist to each property owner to assist them with the process. The Uniform Relocation Act also provides for benefits to displaced individuals to assist them both financially and with advisory services to help them relocate their residences or businesses. Benefits are available to both owner occupants and tenants of either residential or business properties.

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[25] American Public Transportation Association. 2006. *Manual for the Development of System Safety Program Plans for Commuter Railroads*. Washington, DC. May 15, 2006.

[26] FRA. 2009. *Highway-Rail Grade Crossing Guidelines for High-Speed Passenger Rail*. Version 1.0. Washington, DC. November 2009.

[27] Authority. 2011. *Urban Design Guidelines*. Prepared by PB's Placemaking Group. Sacramento, CA. March 2011.

The Uniform Relocation Act requires provision of relocation benefits to all eligible persons regardless of race, color, religion, sex, or national origin. Benefits to which eligible owners or tenants may be entitled will be determined on an individual basis and explained in detail by an assigned right-of-way specialist.

Similarly, the Selected Alternative must adhere to California Relocation Assistance Act requirements. Just compensation is measured by the “fair market value” of the property, which is considered to be “the highest price on the date of valuation that would be agreed to by a seller, being willing to sell, but under no particular or urgent necessity for so doing, nor obliged to sell; and a buyer, being ready, willing and able to buy but under no particular necessity for so doing, each dealing with the other with the full knowledge of all the uses and purposes for which the property is reasonably adaptable and available.” (Code of Civil Procedure, Section 1263.320a).

The Authority has developed more detailed information about how it plans to comply with the Uniform Act and the California Relocation Assistance Act. The Authority has developed three detailed relocation assistance documents modeled after Caltrans versions. The documents are listed below and included in Appendix 3.12-A of the Final EIS:

- Your Rights and Benefits as a Displacee under the Uniform Relocation Assistance Program (Residential).
- Your Rights and Benefits as a Displacee under the Uniform Relocation Assistance Program (Mobile Home).
- Your Rights and Benefits as a Displaced Business, Farm or Nonprofit Organization under the Uniform Relocation Assistance Program.

In addition, the following are incorporated into the Selected Alternative as design features:

- **Develop and implement a construction management plan.** The design-build contractor will develop and implement a construction management plan, for approval by the Authority, to address communications, community impacts, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on property owners and businesses, including low income households and minority populations, and to maintain access to local businesses, residences, and emergency services. Communications to the public will be consistent with the ongoing outreach efforts and providing in other languages, as required, including Spanish, Lao, and Hmong. The plan will maintain access to local businesses during construction and use signs to instruct customers regarding access to businesses during construction. In addition, the plan will include efforts to coordinate with local transit providers to minimize impacts on local and regional bus routes in affected communities. Construction management plans are standard for large infrastructure projects such as this one and are considered effective in minimizing community impacts.
- **Develop a relocation mitigation plan.** Before any acquisitions occur, the Authority will develop a relocation mitigation plan, in consultation with affected cities and counties. In addition to establishing a program to minimize the economic disruption related to relocation, the relocation mitigation plan will be written in a style that also enables it to be used as a public information document. The plan will be intended to meet the following objectives:
  - Provide affected property and business owners and tenants a high level of individualized assistance in situations when relocation is necessary.
  - Make a best effort to minimize the permanent closure of displaced businesses and non-profit agencies as a result of relocations.
  - Within the limits established by law and regulation, minimize the economic disruption caused to tenants and residents by relocation.

- In individual situations where warranted, consider the cost of obtaining the entitlement permits necessary to relocate to a suitable location and take those costs into account when establishing the fair market value of the property.
- Provide those business owners who require complex permitting (such as dairies) with regulatory compliance assistance.

The relocation mitigation plan will include the following components:

- A description of the appraisal, acquisition, and relocation process that describes the activities of the appraisal and relocation specialists, for the benefit of the reader.
- A means of assigning appraisal and relocation staff to affected property owners, tenants, or other residents on an individual basis.
- Individualized assistance to affected property owners, tenants, or other residents in applying for funding, including research to summarize loans, grants, and federal aid available, and research of demographically similar areas for relocation.
- Creation of an ombudsman's position to act as a single point of contact for property owners, residents, and tenants with questions about the relocation process. The ombudsman will also act to address property owners', tenants', and other residents' concerns about the relocation process as it applies to their situations.

10.0 Station Planning, Land Use, and Development Design Features

Between the Program EIR/EIS documents and the project EIS Documents, refined planning (i.e., HST Station Area Development: General Principles and Guidelines[28]) has resulted in fewer anticipated conflicts regarding land use and planning. The program design strategies of involving the local jurisdictions in the development of station planning and alignment design considerations, identification of issues, and avoidance measures and solutions, as well as providing information to assist the local jurisdictions to accommodate the proposed HST and transportation-oriented development (TOD) opportunities around stations in the updates of local general plans, collectively reduce the potential for land use conflicts. By working with the local jurisdictions it is possible to identify any potential land use conflicts and work to avoid or minimize the issues. The Authority will continue to engage the local jurisdictions in continued planning and TOD opportunities. The Authority is assisting the cities of Merced and Fresno with funding for station area planning, and will work cooperatively with these jurisdictions as part of that process.

11.0 Agricultural Land Design Features

Single Point of Contact: The Authority will assign a representative to act as a single point of contact to assist each confined animal facility owner during the process of obtaining new or amended permits or other regulatory compliance necessary for the continued operation or relocation of the facility. The Authority will consider and may provide compensation when acquisition of confined animal site will either require relocation of the facility or amendment of its existing regulatory permits.

Research: During the HST testing phase, the Authority will fund a program to undertake original research on the wind and noise effects of HST operations on agricultural activities. The Authority will engage qualified researchers within the University of California or California State University systems to undertake this research. The researcher will be selected by the Authority through a request for proposal process. The research will include monitoring of noise and wind effects at representative points along the

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[28] Authority. 2008. *HST Station Development Policies*. May 14, 2008, Board Meeting. Sacramento, CA. May 14, 2008.

test track. The research period will include the testing phase and extend 2 years after commencement of revenue service. The Authority will publicly distribute a report of the findings of the research program. The research will include, but is not limited to, the following subjects:

- Generated wind speed, duration, and area of influence from HST trainsets at typical operational speeds.
- Effects of HST-generated wind on the effectiveness of honeybee pollination.
- Dust production as a result of typical HST operations, including entrainment and dispersal patterns of dust in the HST slipstream.
- Generated noise levels and duration from HST trainsets at typical operational speeds.
- Noise contours depicting modeled noise levels at distance from the tracks.
- Practical methods for reducing effects on agriculture.

Farmland Consolidation Program. The Authority will establish and administer a farmland consolidation program to sell remnant parcels to neighboring landowners for consolidation with adjacent farmland properties. In addition, the program will assist the owners of remnant parcels in selling those remnants to adjacent landowners, upon request. The goal of the program is to provide for continued agricultural use on the maximum feasible amount of remnant parcels that otherwise may not uneconomical to farm. The program will focus on severed remainder parcels, including those that were under Williamson Act or Farmland Security Act contract at the time of right-of-way acquisition and have become too small to remain in the local Williamson Act or Farmland Security Act program. The program will assist landowners in obtaining lot line adjustments where appropriate to incorporate remnant parcels into a larger parcel that is consistent with size requirements under the local government general plan. The program will operate for a minimum of 5 years after construction of the section is completed.

The Authority and FRA expect that productive farmland will be farmed in some manner, and not left idle in perpetuity. However, the Authority and FRA recognize that constructing the Selected Alternative will have a disruptive effect on farm ownership that will temporarily idle some remainder parcels. The intent of this mitigation measure is to take responsibility for the disruptive effects and proactively work to restore remainder parcels to productive agricultural use (and not rely on market forces to accomplish the same result). This process will be a series of real estate transactions, and the Authority will use the same real property transaction processes used by Caltrans; this process features the use of Authority right-of-way agents who generally follow Caltrans procedures. The State of California has a long history of managing real estate transactions through Caltrans and other state entities (e.g., Department of General Services), which helps promote the success of the Authority's farmland consolidation program.

12.0 Parks, Recreation, and Open Space Design Features

None.

13.0 Aesthetics and Visual Quality Design Features

The Authority has adopted design standards and Design Guidelines that are established to create a minimum aesthetic quality to a long lasting infrastructure. Many of these elements are articulated in Table 3.16-2 in the Final EIS, Section 3.16.5.3, High-Speed Train Alternatives. The *Urban Design*

Guidelines [29] for the California High-Speed Train Project briefly discusses the principles of context-sensitive solutions to guide the design of stations. This approach is equally applicable to elevated guideways and will be employed to mitigate visual impacts through context-sensitive design. Aesthetic Guidelines for Non-Station Structures (TM 200-06)[30] will also guide design of the HST components. These standards and guidelines work to minimize and avoid aesthetic effects on the adjacent surroundings where possible.

14.0 Cultural and Paleontological Resources Design Features

The California HST Project has considered avoidance and minimization measures consistent with commitments in the Program EIR/EIS documents. Under Section 106 there are several regulatory requirements that must be followed during construction of any federal- and state-funded project, such as halting work in the event of an unanticipated discovery. In addition, mitigation measures have been developed for treatment of adverse effects on compensate for impacts that cannot be avoided. Cultural resources mitigation measures and commitments could occur prior to, during, and following construction. Protective measures, such as conducting archaeological training, building stabilization or archaeological site capping, and recordation of resources will take place prior to construction; other protective measures such as vibration monitoring for built resources or monitoring for archaeological resources during ground disturbing activities will occur during construction. Examples of measures that could take place after construction include interpretive programs, including displays, and interpretive signage.

The Programmatic Agreement (PA) established the framework for the development and implementation of measures to avoid, minimize, or mitigate adverse effects on historic properties caused by the California HST System, in compliance with Section 106 and the National Environmental Policy Act. In accordance with the PA, an Archaeological Treatment Plan (ATP) and a Built Environment Treatment Plan (BETP) have been prepared for the Merced to Fresno Section. The ATP and BETP provide detailed descriptions of treatment measures to avoid, minimize, or mitigate adverse effects caused by the Selected Alternative on historic properties (Section 106) and historical resources (California Environmental Quality Act). The ATP focuses on completion of the identification-level survey, the treatment of known buried historic properties, archaeological monitoring during construction, and provides guidance for unanticipated discoveries. The BETP contains recommended treatments that include, but are not limited to, conditions assessments; research and documentation studies; vibration and noise avoidance measures; and protection and stabilization measures. The ATP and BETP also outline the provisions of the other treatment measures to be implemented for the Selected Alternative, such as responses to unanticipated effects, inadvertent damage or interpretation mitigation.

The ATP and BETP were finalized and approved by the State Historic Preservation Office (SHPO) in a Memorandum of Agreement (MOA) between the Authority, FRA, and SHPO on August 31, 2012. The MOA is tiered from the PA and the Program EIR/EIS documents, and it is an enforceable tool. The MOA was developed in consultation with the SHPO and the Advisory Council on Historic Preservation and includes input from signatories, consulting and concurring parties, and other interested members of the public.

15.0 Regional Growth

None.

[29] Authority. 2011. *Urban Design Guidelines*. Prepared by PB's Placemaking Group. Sacramento, CA. March 2011

[30] Authority. 2011. TM 200.06. *Aesthetic Guidelines for Non-Station Structures*. Sacramento, CA. November 3, 2011.

APPENDIX D

Corrections to the Final EIS (Errata Sheet)

California High-Speed Train Merced to Fresno Section Final EIR/EIS

Errata Sheet

The errata listed below are herewith corrected in the Final Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) and associated technical reports for the Merced to Fresno section of the California High-Speed Train System.

The following errors are herewith corrected (note corrected text in underline and strikethrough).

Table 1
Errata in Final EIR/EIS, Volume I

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Cover Sheet			
1	USACE Address Correction	650 Capitol Mall, Suite 5-200	650 Capitol Mall, Suite 5-200 1325 J Street	typo
	Signature Page			
2			Signature page with signatures	Signature Page does not contain signatures (CD files only, correct in printed and Public web versions)
	Executive Summary			
3			All changes in this table, Table 1 – Errata in Final EIR/EIS, are herewith deemed reflected in the Executive Summary.	
4	Page S-1 Third paragraph	Phase 2 will connect the Central Valley to the state's capital, Sacramento, and will extend the system from Los Angeles to San Diego.	Phase 2 will connect the <u>Sacramento with the rest of the Central Valley</u> and will extend the system from Los Angeles to San Diego	Text correction
5	Page S-27	During the comment period, there were 895 comment submittals on the Merced	During the comment period, there were <u>approximately 700</u> comment submittals on the	Text correction

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Section S.10.1 First and Second Paragraph	to Fresno Section Draft EIR/EIS. Of the 895 submittals, approximately 107 generally supported and 127 were generally opposed to the project.	Merced to Fresno Section Draft EIR/EIS. Of the approximately 700 submittals, approximately 107 generally supported and 127 were generally opposed to the project.	
6	Page S-50 Table S-5 Impact TR#9, Existing Plus Project	**TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8:** These mitigation measures propose to improve intersections and modify stops, traffic lights, and lane movement.	**TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8, TR-MM#9:** These mitigation measures propose to improve intersections and modify stops, traffic lights, and lane movement.	Typographical error
7	Page S-62 Table S-5 Impact Bio#23	Entry under CEQA Level of Significance after Mitigation currently states: "Significant"	CEQA Level of Significance after Mitigation changed to: "Less than significant"	Typo. Text corrected to be consistent with Section 3.7. No change in impact conclusion.
8	Page S-68 Table S-5 Impact Bio#40	The mitigation measures currently reference PK-MM#2.	The mitigation measures herewith reference PK-MM#~~2~~4.	Mitigation numbering updated
9	Page S-69 Table S-5	**Impact:** Ag#2: Permanent conversion of agricultural land form parcel splits. **Significance after mitigation:** Significant **Mitigation Measure:** Ag-MM#2: Consolidate non-economic remnants and create a farmland consolidation program. **Significance after mitigation:** less than Significant	~~**Impact:** Ag#2: Permanent conversion of agricultural land form parcel splits.~~ ~~**Significance after mitigation:** Significant~~ ~~**Mitigation Measure:** Ag-MM#2: Consolidate non-economic remnants and create a farmland consolidation program.~~ ~~**Significance after mitigation:** less than Significant~~	Authority volunteered to establish a farmland consolidation program. No impact requiring mitigation
10	Page S-11 Section S.7 Last paragraph	Emergency response times and access would likely be enhanced from transportation improvements but challenged by dispersed development.	~~"Emergency response times and access would likely be enhanced from transportation improvements but challenged by dispersed development."~~	Most cities have plans to concentrate development more in the future than it is today; therefore this statement is highly speculative for the No Project Alternative.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
11	Page S-53 Table S-5 Bio#3	**Bio MM#16, Bio MM#19**	**MM#17, Bio-MM#18 :**	Changed to reflect current numbering of mitigation measures in Section 3.7
12	Page S-54 Table S-5 Bio#3Bio#4	**Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43,**	**Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44,**	Changed to reflect current numbering of mitigation measures in Section 3.7
13	Page S-54 Table S-5 Bio#3	**Bio-MM#21**	**Bio-MM#22**	Changed to reflect current numbering of mitigation measures in Section 3.7
14	Page S-54 Table S-5 Bio#6	**Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#22, Bio-MM#23, Bio-MM#43, Bio-MM#44:**	**Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#23, Bio-MM#24, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
15	Page S-55 Table S-5 Bio#7	**Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#23, Bio-MM#24,Bio-MM#43**	**Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#24, Bio-MM#25, Bio-MM#44**	Changed to reflect current numbering of mitigation measures in Section 3.7
16	Page S-55 Table S-5 Bio#8	**Bio-MM#43, Bio-MM#44, Bio-MM#51:**	**Bio-MM#44, Bio-MM#45, Bio-MM#53:**	Changed to reflect current numbering of mitigation measures in Section 3.7
17	Page S-56 Table S-5 Bio#9	**Bio-MM#43, Bio-MM#44**	**Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
18	Page S-56 Table S-5 Bio#10	**Bio-MM#28, Bio-MM#30, Bio-MM#31, Bio-MM#32, Bio-MM#33**	**Bio-MM#29, Bio-MM#31, Bio-MM#32, Bio-MM#33, Bio-MM#34**	Changed to reflect current numbering of mitigation measures in Section 3.7

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
19	Page S-57 Table S-5 Bio #11	**Bio-MM#28, Bio-MM#29, Bio-MM#30**	**Bio-MM#29, Bio-MM#30, Bio-MM#31:**	Changed to reflect current numbering of mitigation measures in Section 3.7
20	Page S-57 Table S-5 Bio#12	**Bio-MM#34, Bio-MM#35**	**Bio-MM#35, Bio-MM#36**	Changed to reflect current numbering of mitigation measures in Section 3.7
21	Page S-57 Table S-5 Bio#13	**Bio-MM#36, Bio-MM#37, Bio-MM#38**	**Bio-MM#37, Bio-MM#38, Bio-MM#39**	Changed to reflect current numbering of mitigation measures in Section 3.7
22	Page S-58 Table S-5 Bio#14	**Bio-MM#39, Bio-MM#40, Bio-MM#43, Bio-MM#44**	**Bio-MM#40, Bio-MM#41, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
23	Page S-58 Table S-5 Bio#15	**Bio-MM#41, Bio-MM#42, Bio-MM#43, Bio-MM#44**	**Bio-MM#42, Bio-MM#43, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
24	Page S-59 Table S-5 Bio#16	**Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44**	**Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
25	Page S-59 Table S-5 Bio#17	**Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44**	**Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44, Bio-MM#45:**	Changed to reflect current numbering of mitigation measures in Section 3.7
26	Page S-60 Table S-5 Bio#18	**Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44**	**Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
27	Page S-60 Table S-5 Bio#19	**Bio-MM#43, Bio-MM#44**	**Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
28	Page S-61 Table S-5 Bio#20	**Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44**	**Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
29	Page S-61 Table S-5 Bio#21	**Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44**	**Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#21, Bio-MM#44, Bio-MM#45**	Changed to reflect current numbering of mitigation measures in Section 3.7
30	Page S-62 Table S-5 Bio#22	**Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
31	Page S-62 Table S-5 Bio#23	**Bio-MM#48, Bio-MM#49, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#50, Bio-MM#51, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
32	Page S-62 Table S-5 Bio#24	**Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
33	Page S-63 Table S-5 Bio#25	**Bio-MM#49, Bio-MM#58**	**Bio-MM#51, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
34	Page S-63 Table S-5 Bio#26	**Bio-MM#50, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#52, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
35	Page S-63 Table S-5 Bio#27	**Bio-MM#24, Bio-MM#50, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58:**	**Bio-MM#25, Bio-MM#52, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60:**	Changed to reflect current numbering of mitigation measures in Section 3.7
36	Page S-64 Table S-5 Bio#28	**Bio-MM#47, Bio-MM#51, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#53, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
37	Page S-64 Table S-5 Bio#29	**Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
38	Page S-64 Table S-5 Bio#30	**Bio-MM#47, Bio-MM#52, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#54, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
39	Page S-65 Table S-5 Bio#31	**Bio-MM#53**	**Bio-MM#55**	Changed to reflect current numbering of mitigation measures in Section 3.7
40	Page S-65 Table S-5 Bio#32	**Bio-MM#47, Bio-MM#52, Bio-MM#53, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#54, Bio-MM#55, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
41	Page S-65 Table S-5 Bio#33	**Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
42	Page S-66 Table S-5 Bio#34	**Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
43	Page S-66 Table S-5 Bio#35	**Bio-MM#54, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#56, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
44	Page S-67 Table S-5 Bio#36	**Bio-MM#47, Bio-MM#49, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#51, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
45	Page S-67 Table S-5 Bio#37	**Bio-MM#48, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
46	Page S-67 Table S-5 Bio#38	**Bio-MM#47, Bio-MM#48, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58**	**Bio-MM#49, Bio-MM#50, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60**	Changed to reflect current numbering of mitigation measures in Section 3.7
47	Page S-68 Table S-5 Bio#41	**Bio-MM#47, Bio-MM#48, Bio-MM#55, Bio-MM#56, Bio-MM#57 Bio-MM#58**	**Bio-MM#49, Bio-MM#50, Bio-MM#57, Bio-MM#58, Bio-MM#59 Bio-MM#60,**	Changed to reflect current numbering of mitigation measures in Section 3.7
48	Page S-68 Table S-5	Row "Wildlife Movement Corridor"	Delete Row ~~Wildlife Movement Corridor~~	Typo.
49	Page S-72 Table S-5 Hist#2	**Hist-MM#4**	**~~Hist-MM#4~~** **N&V-MM#1**	Change to match Section 3.17.
50	Page S-72 Table S-5 Hist#3	**PK-MM#4**	**PK-MM#45**	Change to match numbering of Parks section
	Chapter 2			
51	Page 2-83		<u>Adding to the table:</u>	Table missing the

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Table 2-12 Last rows of table before table notes		**No.:** 32 **Dist-County-Hwy-PM**: 13.09 Merced County **Location:** SR99, on/off ramp to Childs Road interchange **Requirements:** Encroachment **HST Alternative:** All **No.:** 33 **Dist-County-Hwy-PM**: 0.99 Madera County **Location:** SR99, on/off ramp to Avenue 7 interchange **Requirements:** Encroachment **HST Alternative:** All	notation of HST encroachments on two facilities. No change in the analysis
	Section 3.2 Transportation			
52	Page 3.2-80 Text preceding Table 3.2-34	It can be noted from the table that seven roadway segments (#4, #7, #17, #20, #22, #50, and #54) would either have a further reduction in LOS below D, or the V/C ratio would increase by 0.04 or more.	It can be noted from the table that seven roadway segments (#4, ~~#7,~~ #11, #17, #20, #22, #50, and #54) would either have a further reduction in LOS below D, or the V/C ratio would increase by 0.04 or more.	Accidental omission
53	Page 3.2-84 Text preceding Table 3.2-35	It can be noted from the table that nine roadway segments (#4, #11, #16, #17, #22, #31, #45, #46, and #50) would either have a further reduction in LOS below D, or the V/C ratio would increase by 0.04 or more.	It can be noted from the table that ~~nine~~ ten roadway segments (#4, #11, #16, #17, #22, #31, #45, #46, #48, and #50) would either have a further reduction in LOS below D, or the V/C ratio would increase by 0.04 or more.	Typo (Impact at this location has been accounted for and mitigation measure has been identified as indicated in Table 3.2-61)
54	Page 3.2-86	No	(Note: highlight the row yellow to show impacted	Impact at this location

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Table 3.2-35 Row No. 48, Impact Column		location) ~~No~~ Yes	has been accounted for and mitigation measure has been identified as indicated in Table 3.2-61
55	Page 3.2-131 Section 3.2.7 Mitigation Measures		First paragraph, last two sentences. In each sentence, delete each parenthetical that begins with: ~~(the mitigation would be based on…)~~ Mitigation would be based on the future plus project analysis scenario; two intersections only impacted under the existing plus project scenario also would be mitigated.	Clarification.
56	Page 3.2-134 Table 3.2-53 15- Veterans Blvd/Golden State Blvd Connector row, in Mitigation Measure(s) Column	**TR MM#3:** Modify Signal Phasing; **TR MM#5:** Restripe Intersections.	**TR MM#3**: Modify Signal Phasing; **TR MM#5**: Restripe Intersections; **TR MM#7**: Widen Approaches to Intersections; **TR MM#8**: Add Exclusive Turn Lanes to Intersections.	Mitigation measure has been identified, but corresponding numbers were not listed. This does not lead to any change in the conclusions.
57	Page 3.2-141 Table 3.2-60 Row for Intersection 80	TR MM#15: Modify signal timing	~~**TR MM#15**: Modify signal timing~~ **TR MM#6:** Modify signal timing	Typo
58				
59	Page 3.2-160 Table 3.2-72 Row for Impact TR#9, Existing Plus Project, , Mitigation Measure column	**TR MM#4**: Add Signal to Intersection to Improve LOS/Operation; **TR MM#5**: Restripe Intersections; **TR MM#6**: Modify Signal Timing; **TR MM#7**: Widen Approaches to Intersections; **TR MM#8:** Add Exclusive	**TR MM#4:** Add Signal to Intersection to Improve LOS/Operation; **TR MM#5:** Restripe Intersections; **TR MM#6:** Modify Signal Timing; **TR MM#7:** Widen Approaches to Intersections; **TR MM#8:** Add Exclusive Turn Lanes to	Mitigation measure has been identified, but corresponding numbers were not listed. This does not lead to any change in the conclusions.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		Turn Lanes to Intersections	Intersections; **TR MM#9**: Convert Two-Way Stop to Four-Way Stop.	
60	Page 3.2-160 Table 3.2-72 Row for Impact TR#9-HST Station Area Impacts, Future (2035) Plus Project, Impact Column	Future (2035) plus Project Merced – 20 intersections (Option A), 19 intersections (Option B) Fresno – 32 intersections (Tulare St Underpass Option), 30 intersections (Tulare St Overpass Option)	Future (2035) plus Project Merced – 20 intersections (Option A), 19 intersections (Option B) Fresno – ~~32~~ <u>38</u> intersections (Tulare St Underpass Option), ~~30,~~<u>36</u> intersections (Tulare St Overpass Option)	Typographical error
	Section 3.3 Air Quality and Global Climate Change			
61	Page 3.3-38 Second paragraph after Table 3.3-7: add reference to 2014 and 2015 in the CEQA Impacts paragraph	**CEQA Impacts:** NO_x CEQA thresholds would be exceeded from 2013 through 2020. VOC CEQA thresholds would be exceeded in 2019. Impacts would be significant for these pollutants in these years, respectively. All other emission rates are predicted to be below the CEQA thresholds for all years of analysis, so impacts would be less than significant.	**CEQA Impacts:** NO_x CEQA thresholds would be exceeded from 2013 through 2020. VOC CEQA thresholds would be exceeded in <u>2014, 2015</u>, and 2019. Impacts would be significant for these pollutants in these years, respectively. All other emission rates are predicted to be below the CEQA thresholds for all years of analysis, so impacts would be less than significant.	Accidental omission
62	Page 3.3-47 Table 3.3-13	In Row "Changes in VMT emissions"/Column "$S0_2$" add negative sign to 5.1 In Row "Total"/Column "$S0_2$" add negative sign to 0.5	-5.1 -0.5	Accidental omission
63	Page 3.3-75 Section 3.3-9 Section for AQ-MM#6	**AQ-MM#6:** Reduce the Potential Impacts of Toxics	**AQ-MM#6:** Reduce the Potential Impacts of <u>Air</u> Toxics	Accidental omission
64	Page 3.3-78 Table 3.3.29 Row for Impact AQ#2,	**AQ-MM#5**: Purchase offsets for emissions associated with hauling	**AQ-MM#5**: Purchase offsets and offsite emissions <u>mitigation</u> associated with hauling ballast materials in ~~BAAQMD and SCAQMD~~ <u>certain air districts</u>	MM#5 title in Section 3.3.9 does not match the title listed in Table 3.3-29. Update table to

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Mitigation Measure Column	ballast material in BAAQMD and SCAQMD.		match.
65	Page 3.3-75, Section 3.3.9	Construction-phase emissions were estimated with these three mitigation measures and the result is that the mitigated emissions for NO_x and VOCs for certain construction years would still be greater than the GC significant impact thresholds. As such, construction phase emissions would be offset as follows:	Replace the first sentence of paragraph between AQ-MM#3 and AQ-MM#4 should read: <u>With AQ-MM#1 and AQ-MM#2, emissions for NOx and VOCs for certain construction years could still be greater than the GC and CEQA significance thresholds.</u> As such, construction phase emissions would be offset as follows:	More exacting language.
66	Page 3.3-75 Table 3.3-29	Impact AQ#1 row	~~AQ-MM#3: Reduce the Potential Impact of Concrete Batch Plants.~~	This measure is not applicable to regional impacts; it is only applicable to the localized impacts of the concrete batch plants (Impact AQ#4).
	Section 3.6 Public Utilities & Energy			
67	Page 3.6-34 First sentence of first paragraph after Table 3.6-13	The UPRR/SR 99 Alternative would cross approximately 164 to 220 utilities; approximately 44 to 57 of these utilities are high risk."	The UPRR/SR 99 Alternative would cross approximately <u>168 to 224</u> utilities; approximately 44 to 57 of these utilities are high risk."	Correction
	Section 3.7 Biological Resources			
68	Page 3.7-114 Section 3.7.6.1 Project Design Options for the San Joaquin River Third paragraph from the	The number of foundation elements is directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Since the future crossing would be located upstream of the two existing bridge structures that carry SR 99 and the UPRR, the hydraulic	Replaced with the following text<u>:</u> The number of foundation elements is directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Since the future crossing would be located upstream of the two existing bridge structures that carry SR 99 and the UPRR, the hydraulic effect of the placement of	Updated per resource agency coordination

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	end of the section.	effect of the placement of new piers within the river corridor on downstream structures and the geomorphology of the channel will be considered during the design of the final configuration of the structure. The HST crossing would be designed with the planned increase in river flows and would not conflict with the goals of the restoration flows.	new piers within the river corridor on downstream structures and the geomorphology of the channel will be considered during the design of the final configuration of the structure. The HST crossing would be designed with the planned increase in river flows and would not conflict with the goals of the restoration flows. The San Joaquin River Crossing Plans and Final Design will incorporate a series of checkpoints (please refer to the series of bullets below). The California High-Speed Rail Authority (Authority) and FRA will coordinate with NMFS, USFWS, CDFG, CVFPB, USACE, U.S. Bureau of Reclamation (Reclamation), and California Department of Water Resources (DWR) to provide additional cross-sectional and profile data of the proposed San Joaquin River crossing as further refinement of the planning and design process continues. The checkpoints will include specific product deliverables and data that could then be used to conduct hydraulic modeling to demonstrate how bridge design might influence in-river processes, such as scour. These analyses will address velocity, turbidity, and fluvial processes, such as sediment scour and deposition. These checkpoints will be developed in concert with the resource agencies to obligate the Design-Build Team to work with NMFS systematically on the design of the crossing. The anticipated design-build phases are itemized below. The first four action items are a part of the preliminary design process to be performed by the Design-Build Team, with the final design completion following NMFS concurrence. The checkpoints are presented below: • Establish Design Hydrology (peak design flow rate): Collect, review and summarize available hydrology.	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			Consult with CVFPB and USACE. Develop original hydrology, if required. • Obtain Existing Conditions Field Data (can start concurrent with the first checkpoint): Aerial and field reconnaissance – field plans. Channel cross-section survey and processing. Geotechnical sampling, testing, and data report. This will include a general evaluation of fill material including potential contaminants. • Establish Existing Conditions Hydraulics (HEC-RAS model): Develop HEC-RAS model for each crossing. Calibrate or validate the model. Establish design water surface elevation and freeboard. Consult with CVFPB and USACE. • Demonstrate Minimal Hydraulic Impacts from Design: Incremental flood rise. Freeboard. Setbacks and levee clearance. Environmental Questionnaire. Scour and channel Stability; considerations for changes in geomorphology. • Final Design incorporating any potential design modifications consistent with findings during the preliminary design process. The Authority will closely coordinate with the Design-Build Team, NMFS, USFWS, and other appropriate agencies during the final design process. Requirements of the design and placement will continue to include compatibility with the intent of the San Joaquin River	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			Restoration Program and the habitat needs of Central Valley steelhead and Central Valley spring-run Chinook salmon. The HST crossing shall be designed with the planned increase in upstream flow releases to maintain or effectively minimize any appreciable changes in scour, sediment transport, and deposition, or changes in geomorphic processes that could alter habitat conditions in a manner that would impede the reestablishment of these species. The Authority, in partnership with the Design-Build Team, will design and conduct a hydraulics/hydrology analysis with appropriate modeling tools and incorporate site-specific data, including the needed geotechnical investigations to develop design (including sizing and location of piers) and construction techniques that are compatible with habitat conditions that support salmonid utilization of the San Joaquin River within the area impacted by the proposed HST crossing. The Authority will coordinate with NMFS, Reclamation, USACE, DWR, CVFPB, and CDFG on the study design methods, hydraulic and geomorphology criteria, and follow-up post construction monitoring to ensure crossing location biological integrity is maintained for habitat primary constituent elements and the compatibility with the goals of the San Joaquin River Restoration Program for the reintroduction of spring-run Chinook salmon and recovering populations of the DPS of Central Valley steelhead. Depending on the results of the hydraulic and hydrologic analyses, the Authority and the Design-Build Team may be required to implement design changes to further avoid and minimize adverse affects to aquatic habitat, where appropriate, and/or make other design changes. Design changes would be evaluated and considered in consultation with NMFS, Reclamation, USACE,	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			DWR, CVFPB, and CDFG. Possible design changes that could be evaluated and considered include the following: • Minor reconfiguration of piers and pier foundations to minimize hydraulic forces and associated potential for scour; and/or • Providing additional armoring along the bed and banks to minimize scour. The Authority, along with the Design-Build Team, will present a detailed San Joaquin River Crossing Plan to NMFS, Reclamation, USACE, DWR, CVFPB, and CDFG that considers the hydraulic and hydrology analyses and that addresses the issues presented above prior to any site preparation or mobilization of work at the San Joaquin River. If the design revisions or refinements are deemed to be substantial changes from the original project description, NMFS or USFWS may reinitiate Endangered Species Act (ESA) Section 7 consultation. Design changes or refinements will be further addressed with the appropriate permitting for USACE, DWR, CVFPB, and CDFG.	
69	Page 3.7-123 Section 3.7.6 Mitigation Measures	**Bio-MM#16**: Mitigation and Monitoring of Protected Trees	~~**Bio-MM#16:** Mitigation and Monitoring of Protected Trees~~	Mitigation not necessary to address impact
70	Page 3.7-125 & 126	**Bio-MM#21**: Implement and Monitor Vernal Pool Protection. If temporary impacts can be avoided, the vernal pool(s) will be protected by erecting exclusion fencing. The Contractor's Biologist, under the supervision of the Project Biologist, will erect and maintain the exclusion fencing. For temporary impacts on vernal pools and other seasonal wetlands that cannot be avoided, the Contractor's Biologist will	The following text has been updated from the EIR/EIS. **Bio-MM#21:** Implement and Monitor Vernal Pool Protection. If construction impacts can be avoided, vernal pool(s) will be protected by erecting exclusion fencing. The Contractor's Biologist, under the supervision of the Project Biologist, will erect and maintain the exclusion fencing. For construction impacts on vernal pools and other seasonal wetlands that cannot be avoided the Contractor's Biologist will apply geotextile fabric	Eliminated overlap of construction and operational impacts – this section only addresses construction and input from resource agencies.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		apply geotextile fabric and a layer of gravel over the affected vernal pool(s) prior to ground-disturbing activities to protect the contours in cases where the area may be excluded from the permanent construction footprint. The Contractor will implement this measure within temporary impact areas within the construction footprint. Resource agency consultations with the USFWS/USACE will occur as needed and based on permit conditions. If temporary impacts occur over a full wet-dry season cycle and the vernal pool(s) cannot be avoided, the vernal pool(s) will be protected by erecting exclusion fencing by the Contractor's Biologist. If temporary impacts occur within the dry season (approximately June 1 to October 15) and the vernal pool(s) cannot be fenced, geotextile fabric and rinsed gravel should be placed within and cover the vernal pool(s) to minimize damage to the soils. The Contractor's Biologist in coordination with the Project Biologist will collect a representative sampling of soils from the vernal pool(s) prior to initiating ground-disturbing activities within vernal pools. The representative soil sample(s) will contain viable plant seeds and vernal pool branchiopod cysts to be preserved from the vernal pool(s). These samples may be incorporated into other vernal pools, as applicable, with USFWS and/or CDFG consultation. If temporary impacts take more than two full wet-dry season cycles, the above-described soil storage	and a layer of gravel over the affected vernal pool(s) prior to ground-disturbing activities to protect the contours in cases where the pool is not direct permanently impacted from the ~~area may be excluded from the permanent~~ construction footprint. The Contractor will implement this measure within~~ temporary impact areas within~~ the construction ~~footprint during~~ areas during one dry season period. Resource agency consultations with the USFWS/USACE will occur as needed to determine impacts per construction schedules and based on permit conditions.· If temporary impacts occur over a full wet-dry season cycle and the vernal pool(s) cannot be avoided, the vernal pool(s) will be protected by erecting exclusion fencing by the Contractor's Biologist. If temporary impacts occur beyond ~~within~~ the dry season (approximately June 1 to October 15) and the vernal pool(s) cannot be fenced, ~~geotextile fabric and rinsed gravel should be placed within and cover the vernal pool(s) to minimize damage to the soils.~~ the Contractor's Biologist in coordination with the Project Biologist will collect a representative sampling of soils from the vernal pool(s) prior to initiating ground-disturbing activities within vernal pools as applicable per USFWS and/or CDFG consultation. The representative soil sample(s) will contain viable plant seeds and vernal pool branchiopod cysts to be preserved from the vernal pool(s). These samples may be incorporated into the same pool or other specified vernal pools. ~~as applicable, with USFWS and/or CDFG consultation~~ If construction ~~temporary~~ impacts take more than ~~two~~ one full wet-dry season cycle~~s, the above-described soil storage and/or~~ offsite mitigation will be implemented.	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		and/or offsite mitigation will be implemented.		
71	Page 3.7-139 Section 3.7.6 Mitigation Measures	**Bio-MM#46**: Wildlife Undercrossings (Implementation)	~~**Bio-MM#46**: Wildlife Undercrossings (Implementation)~~	Measures incorporated into project design
72	Page 3.7-149 Section 3.7.6 Mitigation Measures	**Bio-MM#61:** Wildlife Corridor Artificial Dens	~~**Bio-MM#61:** Wildlife Corridor Artificial Dens~~	Mitigation not necessary to address impact
73	Page 3.7-149 Section 3.7.6 Mitigation Measures	**Bio-MM#62:** Monitoring and Reporting of Wildlife Corridor Undercrossings	~~**Bio-MM#62:** Monitoring and Reporting of Wildlife Corridor Undercrossings~~	No longer required by resource agencies
74	Page 3.7-149 Section 3.7.6 Mitigation Measures	**Bio-MM#63**: Compensate for Impacts on Protected Trees	~~**Bio-MM#63**: Compensate for Impacts on Protected Trees~~	Mitigation not necessary to address impact
75	Page 3.7-160 Table 3.7-30 Summary of Significant Biological Resource Impacts and Mitigation Measures	**Impact: Bio#9:** Construction of the HST alternatives would disturb special-status fish due to potential for turbidity, sediment deposition, and noise exposure**.** **Level of Significance before Mitigation:** Significant **Mitigation: Bio-MM#3:** Prepare and Implement a Worker Environmental Awareness Program; **Bio-MM#5:** Prepare and Implement a Biological Resources Management Plan; **Bio-MM#7:** Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field); **Bio-MM#8:** Equipment Staging Areas; **Bio-MM#10:** Vehicle Traffic;	~~**Impact:** Bio#9: Construction of the HST alternatives would disturb special-status fish due to potential for turbidity, sediment deposition, and noise exposure.~~ ~~**Level of Significance before Mitigation:** Significant~~ ~~**Mitigation: Bio-MM#3:** Prepare and Implement a Worker Environmental Awareness Program;~~ ~~**Bio-MM#5:** Prepare and Implement a Biological Resources Management Plan;~~ ~~**Bio-MM#7:** Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field);~~ ~~**Bio-MM#8:** Equipment Staging Areas;~~ ~~**Bio-MM#10:** Vehicle Traffic;~~ ~~**Bio-MM#12:** Work Stoppage;~~ ~~**Bio-MM#14:** Post-Construction Compliance Reports;~~	Impact was determined not to be significant.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		Bio-MM#12: Work Stoppage; **Bio-MM#14:** Post-Construction Compliance Reports; **Bio-MM#15:** Restore Temporary Riparian Impacts; **Bio-MM#44:** Restore Temporary Impacts on Jurisdictional Waters; **Bio-MM#45:** Monitor Construction Activities within Jurisdictional Waters; **Level of Significance After Mitigation:** Less than Significant	~~**Bio-MM#15:** Restore Temporary Riparian Impacts;~~ ~~**Bio-MM#44:** Restore Temporary Impacts on Jurisdictional Waters;~~ ~~**Bio-MM#45:** Monitor Construction Activities within Jurisdictional Waters;~~ ~~**Level of Significance After Mitigation:** Less than Significant~~	
76	Page 3.7-165 Table 3.7-30 Summary of Significant Biological Resource Impacts and Mitigation Measures	**Impact: Bio#19:** Construction of the HST alternatives would disturb Essential Fish Habitat. **Level of Significance before Mitigation:** Significant **Mitigation:** **Bio-MM#3:** Prepare and Implement a Worker Environmental Awareness Program; **Bio-MM#5:** Prepare and Implement a Biological Resources Management Plan; **Bio-MM#6:** Prepare and Implement a Restoration and Revegetation Plan; **Bio-MM#7:** Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field); **Bio-MM#8:** Equipment Staging Areas; **Bio-MM#10:** Vehicle Traffic; **Bio-MM#14:** Post-Construction Compliance Reports; **Bio-MM#15:** Restore Temporary Riparian Impacts; **Bio-MM#44:** Restore Temporary	~~**Impact: Bio#19:** Construction of the HST alternatives would disturb Essential Fish Habitat.~~ ~~**Level of Significance before Mitigation:** Significant~~ ~~**Mitigation:**~~ ~~**Bio-MM#3:** Prepare and Implement a Worker Environmental Awareness Program;~~ ~~**Bio-MM#5:** Prepare and Implement a Biological Resources Management Plan;~~ ~~**Bio-MM#6:** Prepare and Implement a Restoration and Revegetation Plan;~~ ~~**Bio-MM#7:** Delineate Environmentally Sensitive Areas and Environmentally Restricted Areas (on plans and in-field);~~ ~~**Bio-MM#8:** Equipment Staging Areas;~~ ~~**Bio-MM#10:** Vehicle Traffic;~~ ~~**Bio-MM#14:** Post-Construction Compliance Reports;~~ **Bio-MM#15:** Restore Temporary Riparian Impacts; **Bio-MM#44:** Restore Temporary Impacts on ~~Jurisdictional Waters;~~ ~~**Bio-MM#45:** Monitor Construction Activities~~	Impact was determined not to be significant.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		Impacts on Jurisdictional Waters; **Bio-MM#45**: Monitor Construction Activities within Jurisdictional Waters **Level of Significance After Mitigation:** Less than Significant	~~within Jurisdictional Waters~~ ~~**Level of Significance After Mitigation**: Less than Significant~~	
77	Page 3.7-169 Table 3.7-30 Summary of Significant Biological Resource Impacts and Mitigation Measures	**Impact**: Bio#29: Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status fish. **Level of Significance before Mitigation:** Significant Mitigation Measures: **Bio-MM#4:** Prepare and Implement a Weed Control Plan; **Bio-MM#14:** Post-Construction Compliance Reports; **Bio-MM#49:** Compensate for Permanent Riparian Impacts; **Bio-MM#57:** Conduct Delineation of Jurisdictional Waters and State Streambeds; **Bio-MM#58:** Prepare and Implement a Habitat Mitigation and Monitoring Plan; **Bio-MM#59:** Compensate for Permanent Impacts on Jurisdictional Waters; **Bio-MM#60:** Off-Site Habitat Restoration, Enhancement and Preservation. Level of Significance After Mitigation: Less than Significant	~~**Impact: Bio#29:** Project period impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status fish.~~ ~~**Level of Significance before Mitigation:** Significant~~ ~~**Mitigation Measures:**~~ ~~**Bio-MM#4:** Prepare and Implement a Weed Control Plan;~~ ~~**Bio-MM#14:** Post-Construction Compliance Reports;~~ ~~**Bio-MM#49:** Compensate for Permanent Riparian Impacts;~~ ~~**Bio-MM#57:** Conduct Delineation of Jurisdictional Waters and State Streambeds;~~ ~~**Bio-MM#58:** Prepare and Implement a Habitat Mitigation and Monitoring Plan;~~ ~~**Bio-MM#59:** Compensate for Permanent Impacts on Jurisdictional Waters;~~ ~~**Bio-MM#60:** Off-Site Habitat Restoration, Enhancement and Preservation.~~ ~~**Level of Significance After Mitigation:** Less than Significant~~	Impact was determined not to be significant.
78	Page 3.7-172 Table 3.7-30	**Impact:** Bio#39: Project period impacts from the HST alternatives would require construction in Essential Fish Habitat.	~~**Impact:** Bio#39: Project period impacts from the HST alternatives would require construction in Essential Fish Habitat.~~	Impact was determined not to be significant.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Summary of Significant Biological Resource Impacts and Mitigation Measures	**Level of Significance before Mitigation:** Significant **Mitigation Measures:** Construction period mitigation measures address impacts associated with EFH. There would be no impacts related to project period impacts. **Bio-MM#14:** Post-Construction Compliance Reports. **Level of Significance After Mitigation:** Less than Significant	~~**Level of Significance before Mitigation:** Significant~~ ~~**Mitigation Measures:**~~ ~~Construction period mitigation measures address impacts associated with EFH. There would be no impacts related to project period impacts.~~ ~~**Bio-MM#14:** Post-Construction Compliance Reports.~~ ~~**Level of Significance After Mitigation:** Less than Significant~~	
	Section 3.10 Hazardous Materials and Wastes			
79	Page 3.10-28 Section 3.10.6 Project Design Features Second to last paragraph in section.	"To the extent feasible, the Authority is committed to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operation, and maintenance of the HST System. Moreover, the Authority will evaluate the full inventory of hazardous materials employed on an annual basis and replace hazardous substances with nonhazardous materials to the extent possible. These standards and material specifications would aid in promoting safety for passengers and employees."	"To the extent feasible, the Authority is committed to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operation, and maintenance of the HST System. Moreover, using an Environmental Management System, the Authority will evaluate the full inventory of hazardous materials employed on an annual basis and replace hazardous substances with nonhazardous materials to the extent possible. These standards and material specifications would aid in promoting safety for passengers and employees."	Text clarification.
	Section 3.12 Socioeconomic, Communities and Environmental Justice			
80	Page 3.12-44 Section 3.12.5 Project Impacts Last sentence of first paragraph after table 3.12-11	"Without mitigation the acquisition of the homeless shelter and any impacts on the Children's Wraparound Program would have substantial intensity under NEPA and would be significant under CEQA."	"Without mitigation the acquisition of the homeless shelter would have substantial intensity under NEPA and would be significant under CEQA and any impacts on the Children's Wraparound Program are minimized through design modifications and the impacts would have ~~substantial intensity under NEPA and would be significant~~ moderate intensity under NEPA and less	Text updated for design modifications account for the change in the text.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			than significant under CEQA."	
81	Page 3.12-65 Section 3.12.5 Project Impacts, Environmental Justice Effects Conclusion subsection Fifth sentence of last paragraph of page:	The Authority and FRA, along with EPA, U.S. Housing and Urban Development, and the Federal Transit Administration (FTA), have also entered into a Interagency Partnership and established a "Memorandum of Understanding (MOU) for Achieving an Environmentally Sustainable High-Speed Train System in California," which includes a common goal of integrating HST station access and amenities into the fabric of surrounding neighborhoods (Authority and FRA 2011b).	The Authority and FRA, along with EPA, U.S. Housing and Urban Development, and the Federal Transit Administration (FTA), have also entered into a Interagency Partnership and established a "Memorandum of Understanding (MOU) for Achieving an Environmentally Sustainable High-Speed Train System in California," <u>(see Appendix 3.12-D)</u> which includes a common goal of integrating HST station access and amenities into the fabric of surrounding neighborhoods (Authority and FRA 2011b).	Reference to supporting technical appendix.
82	Page 3.12-67 Section 3.12.6 Design Features	Section 3.12.6 Design Features	<u>The Authority will require that the design-build contractor will develop and implement a construction management plan, for approval by the Authority, to address communications, community impacts, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on property owners and businesses, including low-income households and minority populations, and to maintain access to local businesses, residences, and emergency services. Communications to the public will be consistent with the ongoing outreach efforts and providing in other languages, as required, including Spanish, Lao, and Hmong. The plan will maintain access to local businesses during construction and use signs to instruct customers regarding access to businesses during construction. In addition, the plan will include efforts to coordinate with local transit providers to minimize impacts on local and regional bus routes in affected communities.</u>	These commitments have been deemed part of the project description and project commitments, therefore they are added to Design Features and removed in current location as a mitigation measure.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			Construction management plans are standard for large infrastructure projects such as this one and are considered effective in minimizing community impacts. In order to facilitate relocation processes, before acquisitions occur, the Authority will develop a relocation mitigation plan, in consultation with affected cities and counties. In addition to establishing a program to minimize the economic disruption related to relocation, the relocation mitigation plan will be written in a style that also enables it to be used as a public information document. The plan will be intended to meet the following objectives: • Provide affected property and business owners and tenants a high level of individualized assistance in situations when relocation is necessary. • Make a best effort to minimize the permanent closure of displaced businesses and non-profit agencies as a result of relocations. • Within the limits established by law and regulation, minimize the economic disruption caused to tenants and residents by relocation. • In individual situations where warranted, consider the cost of obtaining the entitlement permits necessary to relocate to a suitable location and take those costs	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			<u>into account when establishing the fair market value of the property.</u> • <u>Provide those business owners who require complex permitting (such as dairies) with regulatory compliance assistance.</u> <u>The relocation mitigation plan will include the following components:</u> • <u>A description of the appraisal, acquisition, and relocation process that describes the activities of the appraisal and relocation specialists, for the benefit of the reader.</u> • <u>A means of assigning appraisal and relocation staff to affected property owners, tenants, or other residents on an individual basis.</u> • <u>Individualized assistance to affected property owners, tenants, or other residents in applying for funding, including research to summarize loans, grants, and federal aid available, and research of demographically similar areas for relocation.</u> • <u>Creation of an ombudsman's position to act as a single point of contact for property owners, residents, and tenants with questions about the relocation process. The ombudsman would also act to address property owners', tenants', and other residents' concerns about the</u>	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
			<u>relocation process as it applies to their situations.</u> Relocation mitigation plans are commonly used for large infrastructure projects that remove a large number of residences and businesses, such as this project, and are considered successful in minimizing the impact to individual property owners.	
83	Page 3.12-67 Section 3.12.7 Construction Period Mitigation Measures	**SO-MM#1: Develop and implement a construction management plan.** The design-build contractor will develop and implement a construction management plan, for approval by the Authority, to address communications, community impacts, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on property owners and businesses, including low-income households and minority populations, and to maintain access to local businesses, residences, and emergency services. Communications to the public will be consistent with the ongoing outreach efforts and providing in other languages, as required, including Spanish, Lao, and Hmong. The plan will maintain access to local businesses during construction and use signs to instruct customers regarding access to businesses during construction. In addition, the	~~**SO-MM#1: Develop and implement a construction management plan.** The design-build contractor will develop and implement a construction management plan, for approval by the Authority, to address communications, community impacts, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on property owners and businesses, including low-income households and minority populations, and to maintain access to local businesses, residences, and emergency services. Communications to the public will be consistent with the ongoing outreach efforts and providing in other languages, as required, including Spanish, Lao, and Hmong. The plan will maintain access to local businesses during construction and use signs to instruct customers regarding access to businesses during construction. In addition, the plan will include efforts to coordinate with local transit providers to minimize impacts on local and regional bus routes in affected communities. Construction management plans are standard for large infrastructure projects such as this one and are considered effective in~~	These commitments have been deemed part of the project description and project commitments, therefore they are added to Design Features and removed in current location as a mitigation measure.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		plan will include efforts to coordinate with local transit providers to minimize impacts on local and regional bus routes in affected communities. Construction management plans are standard for large infrastructure projects such as this one and are considered effective in minimizing community impacts. **SO-MM#2: Develop a relocation mitigation plan.** Before any acquisitions occur, the Authority will develop a relocation mitigation plan, in consultation with affected cities and counties. In addition to establishing a program to minimize the economic disruption related to relocation, the relocation mitigation plan will be written in a style that also enables it to be used as a public information document. The plan will be intended to meet the following objectives: • Provide affected property and business owners and tenants a high level of individualized assistance in situations when relocation is necessary. • Make a best effort to minimize the permanent closure of displaced businesses and non-profit agencies as a result of	~~minimizing community impacts.~~ ~~**SO-MM#2: Develop a relocation mitigation plan.** Before any acquisitions occur, the Authority will develop a relocation mitigation plan, in consultation with affected cities and counties. In addition to establishing a program to minimize the economic disruption related to relocation, the relocation mitigation plan will be written in a style that also enables it to be used as a public information document. The plan will be intended to meet the following objectives:~~ ~~• Provide affected property and business owners and tenants a high level of individualized assistance in situations when relocation is necessary.~~ ~~• Make a best effort to minimize the permanent closure of displaced businesses and non-profit agencies as a result of relocations.~~ ~~• Within the limits established by law and regulation, minimize the economic disruption caused to tenants and residents by relocation.~~ ~~• In individual situations where warranted, consider the cost of obtaining the entitlement permits necessary to relocate to a suitable location and take those costs into account when establishing the fair market value of the property.~~	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		relocations. • Within the limits established by law and regulation, minimize the economic disruption caused to tenants and residents by relocation. • In individual situations where warranted, consider the cost of obtaining the entitlement permits necessary to relocate to a suitable location and take those costs into account when establishing the fair market value of the property. • Provide those business owners who require complex permitting (such as dairies) with regulatory compliance assistance. The relocation mitigation plan will include the following components: • A description of the appraisal, acquisition, and relocation process that describes the activities of the appraisal and relocation specialists, for the benefit of the reader. • A means of assigning appraisal and relocation staff to affected property owners, tenants, or other residents on an individual	• ~~Provide those business owners who require complex permitting (such as dairies) with regulatory compliance assistance.~~ ~~The relocation mitigation plan will include the following components:~~ • ~~A description of the appraisal, acquisition, and relocation process that describes the activities of the appraisal and relocation specialists, for the benefit of the reader.~~ • ~~A means of assigning appraisal and relocation staff to affected property owners, tenants, or other residents on an individual basis.~~ • ~~Individualized assistance to affected property owners, tenants, or other residents in applying for funding, including research to summarize loans, grants, and federal aid available, and research of demographically similar areas for relocation.~~ • ~~Creation of an ombudsman's position to act as a single point of contact for property owners, residents, and tenants with questions about the relocation process. The ombudsman would also act to address property owners', tenants', and other residents' concerns about the relocation process as it applies to their situations.~~ Relocation mitigation plans are commonly used for	

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		basis. • Individualized assistance to affected property owners, tenants, or other residents in applying for funding, including research to summarize loans, grants, and federal aid available, and research of demographically similar areas for relocation. • Creation of an ombudsman's position to act as a single point of contact for property owners, residents, and tenants with questions about the relocation process. The ombudsman would also act to address property owners', tenants', and other residents' concerns about the relocation process as it applies to their situations. Relocation mitigation plans are commonly used for large infrastructure projects that remove a large number of residences and businesses, such as this project, and are considered successful in minimizing the impact to individual property owners.	large infrastructure projects that remove a large number of residences and businesses, such as this project, and are considered successful in minimizing the impact to individual property owners.	
	Section 3.14 Agricultural Lands			
84	Page 3.14-20 3.14.7 Mitigation	**Ag-MM # 2: Consolidate Remnant Farmlands.** The Authority will establish and administer a farmland consolidation	~~**Ag-MM # 2: Consolidate Remnant Farmlands.** The Authority will establish and administer a farmland consolidation program to sell~~	The commitment to a farmland consolidation

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Measures	program to sell remnant parcels to neighboring landowners for consolidation with adjacent farmland properties. In addition, the program will assist the owners of remnant parcels in selling those remnants to adjacent landowners, upon request. The goal of the program is to provide for continued agricultural use on the maximum feasible amount of remnant parcels that otherwise may not uneconomical to farm. The program will focus on severed remainder parcels, including those that were under Williamson Act or Farmland Security Act contract at the time of right-of-way acquisition and have become too small to remain in the local Williamson Act or Farmland Security Act program. The program will assist landowners in obtaining lot line adjustments where appropriate to incorporate remnant parcels into a larger parcel that is consistent with size requirements under the local government general plan. The program will operate for a minimum of 5 years after construction of the section is completed. The Authority and FRA expect that productive farmland would be farmed in some manner, and not left idle in perpetuity. However, the Authority and FRA recognize that constructing the Merced to Fresno section of the HST Project would have a disruptive effect on farm ownership that would temporarily idle some remainder parcels. The intent of this mitigation measure is to take responsibility for the disruptive effects and proactively work to restore	~~remnant parcels to neighboring landowners for consolidation with adjacent farmland properties. In addition, the program will assist the owners of remnant parcels in selling those remnants to adjacent landowners, upon request. The goal of the program is to provide for continued agricultural use on the maximum feasible amount of remnant parcels that otherwise may not uneconomical to farm. The program will focus on severed remainder parcels, including those that were under Williamson Act or Farmland Security Act contract at the time of right-of-way acquisition and have become too small to remain in the local Williamson Act or Farmland Security Act program. The program will assist landowners in obtaining lot line adjustments where appropriate to incorporate remnant parcels into a larger parcel that is consistent with size requirements under the local government general plan. The program will operate for a minimum of 5 years after construction of the section is completed.~~ ~~The Authority and FRA expect that productive farmland would be farmed in some manner, and not left idle in perpetuity. However, the Authority and FRA recognize that constructing the Merced to Fresno section of the HST Project would have a disruptive effect on farm ownership that would temporarily idle some remainder parcels. The intent of this mitigation measure is to take responsibility for the disruptive effects and proactively work to restore remainder parcels to productive agricultural use (and not rely on market forces to accomplish the same result). This process would be a series of real estate transactions, and the Authority would be using the same real property transaction processes used by Caltrans; this process features the use of Authority right-of-way agents who generally follow Caltrans procedures. The State of California has a long~~	program has been deemed part of the project and has been added to Design Features and removed in current location as a mitigation measure.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
		remainder parcels to productive agricultural use (and not rely on market forces to accomplish the same result). This process would be a series of real estate transactions, and the Authority would be using the same real property transaction processes used by Caltrans; this process features the use of Authority right-of-way agents who generally follow Caltrans procedures. The State of California has a long history of managing real estate transactions through Caltrans and other state entities (e.g., Department of General Services), which helps promote the success of the Authority's farmland consolidation program.	~~history of managing real estate transactions through Caltrans and other state entities (e.g., Department of General Services), which helps promote the success of the Authority's farmland consolidation program.~~	
85	Page 3.14-40 3.14.6 Project Design Features		The Authority and FRA expect that severance parcels of productive farmland would be farmed in some manner, and not left idle in perpetuity. The Authority and FRA would take responsibility for restoring remainder parcels to productive agricultural use (and not rely on market forces to accomplish the same result). This process would be a series of real estate transactions, and the Authority would be using the same real property transaction processes used by Caltrans; this process features the use of Authority right-of-way agents who generally follow Caltrans procedures. The State of California has a long history of managing real estate transactions through Caltrans and other state entities (e.g., Department of General Services), which helps promote the success of the Authority's farmland consolidation program.	The commitment to a farmland consolidation program has been deemed part of the project and has been added to Design Features and removed in current location as a mitigation measure

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Page 3.14-42 Section 3.14.9 CEQA Significance Conclusions, Table 3.14-16 Ag#2: Permanent Conversion of Agricultural Land from Parcel Splits	The UPRR/SR 99 Alternative would sever 52 large farm parcels along the Ave 24 Wye with the East Chowchilla design option, 34 large farm parcels along the Ave 24 Wye with the West Chowchilla design option, and 32 large farm parcels along the Ave 21 Wye. The BNSF Alternative would sever from 80 to 120 large farm parcels with the Mission Ave design options and from 90 to 124 large farm parcels with the Mariposa Way design options. The Hybrid Alternative would sever approximately 80 large farm parcels.	~~The UPRR/SR 99 Alternative would sever 52 large farm parcels along the Ave 24 Wye with the East Chowchilla design option, 34 large farm parcels along the Ave 24 Wye with the West Chowchilla design option, and 32 large farm parcels along the Ave 21 Wye.~~ ~~The BNSF Alternative would sever from 80 to 120 large farm parcels with the Mission Ave design options and from 90 to 124 large farm parcels with the Mariposa Way design options.~~ ~~The Hybrid Alternative would sever approximately 80 large farm parcels.~~	The commitment to a farmland consolidation program has been deemed part of the project and has been added to Design Features and removed in current location as a mitigation measure
86	Page 3.14-41 - 42 Section 3.14.8 NEPA Impacts Summary, 4th bullet	Mitigation measures AG-MM#1 and AG-MM#2 will ensure that land is preserved for agriculture and that remnant parcels are consolidated so that they remain in agricultural production. Mitigation Measures Ag-MM#1 and Ag-MM#2 will not replace the farmlands in an area of highly production agricultural soils that are threatened by development encroachment; therefore, would be considered a significant impact under NEPA.	Mitigation measure~~s~~ AG-MM#1 ~~and AG-MM#~~2 will ensure that land is preserved for agriculture and that remnant parcels are consolidated so that they remain in agricultural production. Mitigation Measure~~s~~ Ag-MM#1 ~~and Ag-MM#2~~ will not replace the farmlands in an area of highly production agricultural soils that are threatened by development encroachment; therefore, would be considered a significant impact under NEPA.	The commitment to a farmland consolidation program has been deemed part of the project and has been added to Design Features and removed in current location as a mitigation measure
	Section 3.15 Parks, Recreation, and Open Space			
87	Page 3.15-47 Section 3.15.7 Mitigation Measures PK-MM#4 at top of page	"… CDFG agreed to a Resolution of Necessity on March 2, 2012, to accommodate the HST Project under Title 14 (Gibson 2012)."	~~"… CDFG agreed to a Resolution of Necessity on March 2, 2012, to accommodate the HST Project under Title 14 (Gibson 2012)."~~"…The Authority would prepare and issue a Resolution of Necessity and submit it to the Public Works Boards as part of the right-of-way acquisition process."	Text clarified.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Section 3.16 Aesthetics and Visual Resources			
88	Page 3.16-29 Section 3.16.5.3, Construction Period Impacts, Common Aesthetics and Visual Quality Impacts, Visual Impacts on Adjacent Land Uses subsection, second paragraph.	"Construction activities would cease after completion; therefore, impacts from these activities are considered temporary and therefore would have negligible intensity under NEPA and would be less than significant under CEQA."	~~"Construction activities would cease after completion; therefore, impacts from these activities are considered temporary and therefore would have negligible intensity under NEPA and would be less than significant under CEQA."~~ "Under all alternatives construction activities would cause visual impacts in urban areas, therefore they would have a moderate intensity under NEPA and would be significant under CEQA."	Consistency issue.
	Section 3.17 Cultural and Paleontological Resources			
89	Page 3.17-84 Section 3.17.6.1 Arch-MM#3 subsection, first paragraph	If project engineering concludes that avoidance is not feasible, a process to determine whether the site can be preserved through intentional site burial will be considered. When complete avoidance is not possible, preservation in-place is the preferred form of mitigation for an "historical resource of an archaeological nature" because it retains the relationships between artifact and context, and may avoid conflicts with groups associated with the site, pursuant to PRC 15126.4(b)(3)(A). The process, presented in overview below, is specified in detail in the ATP, which is being developed in coordination with all of the project's consulting parties (noted above).	If project engineering concludes that avoidance is not feasible, a process to determine whether the site can be preserved through intentional site burial will be considered. When complete avoidance is not possible, preservation in-place is the preferred form of mitigation for an "historical resource of an archaeological nature" because it retains the relationships between artifact and context, and may avoid conflicts with groups associated with the site, pursuant to ~~PRC~~ CEQA Guidelines 15126.4(b)(3)(A). The process, presented in overview below, is specified in detail in the ATP, which is being developed in coordination with all of the project's consulting parties (noted above).	Text correction.
90	Page 3.17-93 Table 3.17-11 Row for Impact Hist#3	**PK-MM#4:** Address Noise at Roeding Park with City of Fresno **Hist-MM#4:** Minimize Adverse Noise Effects	**PK-MM#4 5:** Address Noise at Roeding Park with City of Fresno **Hist-MM#4:** Minimize Adverse Noise Effects	Mitigation numbering updated.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
91	Page 3.17-93 Table 3.17-11 Row for Impact Hist#2	**Hist-MM#4:** Minimize Adverse Noise Effects;	~~**Hist-MM#4:** Minimize Adverse Noise Effects~~ **N&V-MM#1**: Construction Noise Mitigation Measures	Reference to specific noise mitigation measures.
92	Page 3.17-93 Table 3.17-11 Row for Impact Hist#2, first column	Hist#2: Effects on Historically Significant Built-Environment Resources during Construction UPRR/SR 99 alternative would cause substantial adverse change to Roeding Park.	**Hist#2: Effects on Historically Significant Built-Environment Resources during Construction** UPRR/SR 99, <u>BNSF, and Hybrid</u> alternatives would cause substantial adverse change to Roeding Park.	Consistency error with text body.
93	Page 3.17.92 Table 3.17-11 Row for Impact Hist#1, Mitigation Measures column	**Hist-MM#4:** Minimize Adverse Noise Effects;	~~**Hist-MM#4:** Minimize Adverse Noise Effects;~~	Hist-MM#1 applies to operational impacts, not construction impacts and therefore is not necessary for Hist #1.
94	Page 3.17.93 Table 3.17-11 Row for Impact Hist#1, first column, last line of row	"moto's Department Store"	"- <u>Ko</u>moto's Department Store and Hotel"	Text correction
	Section 3.19 Cumulative Impacts			
95	Page 3.19-8 Section 3.19.3.2 Air Quality and Global Climate Change, page 3.19.8	Construction emission impacts would be temporary, and would not contribute to air quality degradation and impede the region's ability to attain air quality standards. GHG emissions associated with project construction would be offset by the emission reduction during HST operation.	Construction emission impacts would be temporary, ~~and would not contribute to air~~ <u>and as mitigated/offset would not contribute</u> to air quality degradation and impede the region's ability to attain air quality standards.	Clarifying text.

#	Reference	Incorrect Final EIR/EIS Text	Correction to Final EIR/EIS	Reason for Correction
	Chapter 7 Preferred Alternative			
96	Page 7.2 Section 7.2 First Paragraph	During the comment period, there were 895 comment submittals on the Merced to Fresno Section Draft EIR/EIS.	During the comment period, there were ~~895~~ <u>approximately 700</u> comment submittals on the Merced to Fresno Section Draft EIR/EIS.	Text correction
97	Page 7.2 Section 7.2 Second Paragraph	Of the 895 submittals, approximately 107 generally supported and 127 were generally opposed to the project.	Of the <u>approximately</u> ~~895~~ <u>700</u> submittals, approximately 107 generally supported and 127 were generally opposed to the project.	Text correction
	Chapter 8 Public and Agency Involvement			
98	Page 8-9 Section 8.6.2 Second Paragraph	During the comment period, there were 895 comment submittals on the Merced to Fresno Section Draft EIR/EIS.	During the comment period, there were <u>approximately 700</u> comment submittals on the Merced to Fresno Section Draft EIR/EIS.	Text correction

Table 2
Errata in Technical Appendices, Volume II

#	Reference	Incorrect Volume II Text	Correction to Volume II Text	Reason for Update
Appendix 3.14-B				
99	Page 3.14-B-5	AJ Dairy Description of impacts to confined animal agriculture identifies the dairy at 23468 Road 12 as the AJ Dairy.	All references to this dairy will now use the name Fugendes Dairy. All references to the AJ Dairy are herewith deleted and replaced with Fagundes Dairy.	Mislabeled
100	Page 3.14-B-7	Valley Calf contains both feedlot and poultry operations.[3] The facility, located at 10654 Avenue 24, would be affected by all alternatives using the Ave 24 Wye. The alignment would require acquisition of the northern portion of the property, approximately 220 feet into the property from Avenue 24. This would require the acquisition of the entire poultry operation Footnote 3: In the EIR/EIS and in the original version of this memorandum, the poultry operation was not shown. It appears to have been recently installed.	The following text has been removed or changed: ~~Valley Calf contains both feedlot and poultry operations.[3]~~ The Valley Calf facility, located at 10654 Avenue24, would be affected by all alternatives using the Ave 24 Wye. The alignment would require acquisition of the northern portion of the property, approximately 220 feet into the property from Avenue 24. This would require the acquisition of the entire ~~poultry operation~~ portion of the property that fronts Ave 24. ~~Footnote 3: In the EIR/EIS and in the original version of this memorandum, the poultry operation was not shown. It appears to have been recently installed~~	Correction of use of property
101	Page 3.14-B-7	The HST alignment itself would require acquisition of the northern portion of the property, which in turn would require acquisition of the entire poultry operation.	The following text has been removed: The HST alignment itself would require acquisition of the northern portion of the property.~~, which in turn would require acquisition of the entire poultry operation.~~	Corrrection of use of property
102	Page 3.14-B-17	AJ Dairy Description of impacts to confined animal agriculture identifies the dairy at 23468 Road 12 as the AJ Dairy.	Description of impacts to confined animal agriculture identifies the dairy at 23468 Road 12 as the AJ Dairy. All references to this dairy will now use the name Fagundes Dairy. All references to the ~~AJ Dairy~~ will be removed.	Mislabeled

#	Reference	Incorrect Volume II Text	Correction to Volume II Text	Reason for Update
	Appendix 5-B, Operating Cost Memorandum			
103	Page 5-B-2	The cost per route mile to maintain the infrastructure is estimated at $200,000, based on U.S. labor costs.	The cost per route mile to maintain the infrastructure is estimated at <u>$206,000</u> based on U.S. labor costs.	Estimate escalated from 2009$ to 2010$ for consistency with other estimates.

Table 3
Errata in Response to Comments, Volume IV

#	Reference	Incorect Volume IV Text	Correction to Volume IV Text	Reason for Update
	Chapter 16. Standard Responses			
104	Chapter 16, Standard Responses MF-Response-GENERAL-14	The Authority is committed to working with agricultural property owners to resolve or mitigate, if possible, acquisitions that result in the division of farmlands. Mitigation measures include creation of a farmland consolidation program to sell these uneconomic remnant parcels to neighboring landowners (see Mitigation Measure AG-MM#2 in Section 3.14.6 of the EIR/EIS) and creation of overcrossings or undercrossings at reasonable intervals to preserve access across the HST right-of-way (see Mitigation Measure S0-MM#8 in Section 3.12.7 of the EIR/EIS).	The Authority is committed to working with agricultural property owners to resolve or mitigate, if possible, acquisitions that result in the division of farmlands. The Authority has therefore incorporated a farmland consolidation program into the project and will work to ensure that remnant parcels can remain in productive agricultural use. In addition, the Authority will create overcrossings or undercrossings at reasonable intervals to preserve access across the HST right-of-way (see Mitigation Measure S0-MM#8 in Section 3.12.7 of the EIR/EIS).	Ag-MM#2 has been adopted as a design feature and therefore is not listed as a mitigation measure rather it is referred to as a commitment under design features.
105	Chapter 16, Standard Responses MF-Response-LAND USE-2	The project's impacts on agricultural lands as a result of conversion and parcel severance would be significant (see Section 3.14.5). Mitigation measures Ag-MM#1 (preserve farmland), Ag-MM#2 (consolidating remnant parcels), and SO-MM#8 (providing access to farmland) will reduce these impacts, but not below the level of significance.	The project's impacts on agricultural lands as a result of conversion to non-agricultural use ~~and parcel severance~~ would be significant (see Section 3.14.5). Design features and mitigation measure Ag MM# 1 and ~~Ag-MM#1 (preserve farmland), Ag-MM#2 (consolidating remnant parcels), and~~ SO-MM#8 (providing access to farmland) will reduce these impacts, but not below the level of significance.	Ag-MM#2 has been adopted as design features and therefore is not listed as a mitigation measure, rather it is referred to as a commitment under design features.

#	Reference	Incorect Volume IV Text	Correction to Volume IV Text	Reason for Update
106	Chapter 16, Standard Responses MF-Response-AGRICULTURE-3	The EIR/EIS discusses a subset of severed parcels called unusable remainders or non-economic remainders. These parcels were included in the project acquisition area, and their acreage counted as part of the direct impact area (the construction footprint). The rationale is that there would be no apparent use of these remainders, and so they should be acquired by the Authority even though they would not be needed for any project use (HST alignments, road modifications, etc.). It is possible that these remainders may have some use during construction (e.g., material storage), and would be available for use by the construction contractors. After construction, it is possible that these remainders could be consolidated with other nearby parcels – that is the intent of Ag-MM#2. The proposed consolidation measure is a realistic commitment for mitigating severance impacts, and is consistent with programs used for other linear transportation facilities (e.g., Caltrans projects).	The EIR/EIS discusses a subset of severed parcels called unusable remainders or non-economic remainders. These parcels were included in the project acquisition area, and their acreage counted as part of the direct impact area (the construction footprint). The rationale is that there would be no apparent use of these remainders, and so they should be acquired by the Authority even though they would not be needed for any project use (HST alignments, road modifications, etc.). It is possible that these remainders may have some use during construction (e.g., material storage), and would be available for use by the construction contractors. After construction, it is possible that these remainders could be consolidated with other nearby parcels – ~~that is the intent of Ag-MM#2~~ <u>see Section 3.14.6, Project Design Features.</u> The farmland consolidation program will contribute to ensuring that the maximum amount of agricultural land is available for and continued in agricultural use. The program is a realistic commitment for ensuring continuing agricultural use on remainder parcels and is consistent with programs used for other linear transportation facilities (e.g., Caltrans projects).	Ag-MM#2 has been adopted as a design feature and therefore is not listed as a mitigation measure rather it is referred to as a commitment under design features.
107	Chapter 16, Standard Responses MF-Response-GENERAL-14	The Authority is committed to working with agricultural property owners to resolve or mitigate, if possible, acquisitions that result in the division of farmlands. Mitigation measures include creation of a farmland consolidation program to sell these uneconomic remnant parcels to neighboring landowners (see Mitigation Measure AG-MM#2 in Section 3.14.6 of the EIR/EIS) and creation of overcrossings or undercrossings at reasonable intervals to preserve access across the HST right-	The Authority is committed to working with agricultural property owners to resolve or mitigate, if possible, acquisitions that result in the division of farmlands. . The Authority has therefore incorporated a farmland consolidation program into the project and will work to ensure that remnant parcels can remain in productive agricultural use. (In addition, the Authority will create overcrossings or undercrossings at reasonable intervals to preserve access across	Ag-MM#2 has been adopted as a design feature and therefore is not listed as a mitigation measure rather it is referred to as a commitment under design features.

#	Reference	Incorect Volume IV Text	Correction to Volume IV Text	Reason for Update
		of-way (see Mitigation Measure SO-MM#8 in Section 3.12.7 of the EIR/EIS).	the HST right-of-way (see Mitigation Measure SO-MM#8 in Section 3.12.7 of the EIR/EIS).	
108	Chapter 16, Standard Responses MF-Response-LAND USE-2	The project's impacts on agricultural lands as a result of conversion and parcel severance would be significant (see Section 3.14.5). Mitigation measures Ag-MM#1 (preserve farmland), Ag-MM#2 (consolidating remnant parcels), and SO-MM#8 (providing access to farmland) will reduce these impacts, but not below the level of significance.	The project's impacts on agricultural lands as a result of agricultural land conversion to non agricultural use ~~and parcel severance~~ would be significant (see Section 3.14.5). Design Features and the mitigation measures Ag MM#1 ~~Ag-MM#1 (preserve farmland), Ag-MM#2 (consolidating remnant parcels),~~ and SO-MM#8 (providing access to farmland) will reduce these impacts, but not below the level of significance.	Ag-MM#2 has been adopted as a design feature and therefore is not listed as a mitigation measure rather it is referred to as a commitment under design features.
109	Chapter 16, Standard Responses MF-Response-AGRICULTURE-3	The EIR/EIS discusses a subset of severed parcels called unusable remainders or non-economic remainders. These parcels were included in the project acquisition area, and their acreage counted as part of the direct impact area (the construction footprint). The rationale is that there would be no apparent use of these remainders, and so they should be acquired by the Authority even though they would not be needed for any project use (HST alignments, road modifications, etc.). It is possible that these remainders may have some use during construction (e.g., material storage), and would be available for use by the construction contractors. After construction, it is possible that these remainders could be consolidated with other nearby parcels – that is the intent of Ag-MM#2 see Section 3.14.6, Project Design Features. The proposed consolidation measure is a realistic commitment for mitigating severance impacts, and is consistent with programs used for other linear transportation facilities (e.g., Caltrans projects).	The EIR/EIS discusses a subset of severed parcels called unusable remainders or non-economic remainders. These parcels were included in the project acquisition area, and their acreage counted as part of the direct impact area (the construction footprint). The rationale is that there would be no apparent use of these remainders, and so they should be acquired by the Authority even though they would not be needed for any project use (HST alignments, road modifications, etc.). It is possible that these remainders may have some use during construction (e.g., material storage), and would be available for use by the construction contractors. After construction, it is possible that these remainders could be consolidated with other nearby parcels – ~~that is the intent of Ag-MM#2~~ see Section 3.14.6, Project Design Features. The farmland consolidation program will contribute to ensuring that the maximum amount of agricultural land is available for and continued in agricultural use. The consolidation program is a realistic commitment for ensuring continuing agricultural use on remainder parcels, and is consistent with programs used for other	Ag-MM#2 has been adopted as a design feature and therefore is not listed as a mitigation measure rather it is referred to as a commitment under design features.

#	Reference	Incorect Volume IV Text	Correction to Volume IV Text	Reason for Update
			linear transportation facilities (e.g., Caltrans projects).	

Table 4
Errata in Technical Reports and Other Materials

#	Reference	Incorect Text	Correction to Text	Reason for Update
	Air Quality Technical Report			
110	Appendix C, Table of Contents, page i	C.1-8 Regional Emissions: Vehicle Miles Traveled C.1-9 Statewide Emissions: Vehicle Miles Traveled C.1-10 Regional and Statewide Emissions: Power and Flight Demands	C.1-8 Regional <u>and Statewide</u> Emissions: Vehicle Miles Traveled, <u>50% Fare Scenario</u> C.1-9 Regional <u>and Statewide</u> Emissions: Vehicle Miles Traveled, <u>83% Fare Scenario</u> C.1-10 Regional <u>and Statewide</u> Emissions: ~~Power and~~ Flight Demands	Text Clarified
	Hydraulics and Floodplain Technical Report			
111	Tables 6-3 (page 6-12) and 6-5 (page 6-21)	Note 6: Since 1981, there have been three re-studies and revisions for the San Joaquin River (1996, 1998, and 2000). The 2000 study of the San Joaquin is reported in the Madera County FIS (2008) and Fresno County FIS (2009). Note 7: ... USACE orally indicated flow is valid upstream to Friant Dam.	Note 6: Since 1981, there have been three re-studies and revisions for the San Joaquin River <u>hydrology that occurred in 1996, 1998, and 2000. All three studies are referenced</u> in the Madera County FIS (FEMA 2008b) and Fresno County FIS (2009a). Note 7: ... USACE orally indicated flow is valid upstream to Friant Dam (<u>Larson 2010b</u>).	Omission
112	Table 6-4 Page 6-17	Note 7: Since 1981, there have been three re-studies and revisions for the San Joaquin River (1996, 1998, and 2000). The 2000 study of the San Joaquin is reported in the Madera County FIS (2008) and Fresno County FIS (2009). Note 8: ... USACE orally indicated flow is valid upstream to Friant Dam.	Omission corrected as follows: Note 6: Since 1981, there have been three re-studies and revisions for the San Joaquin River <u>hydrology that occurred in 1996, 1998, and 2000. All three studies are referenced</u> in the Madera County FIS (FEMA 2008b) and Fresno County FIS (2009a).	Omission

#	Reference	Incorect Text	Correction to Text	Reason for Update
			Note 8: … USACE orally indicated flow is valid upstream to Friant Dam (Larson 2010b).	
113	Section 3.1.2.1, p. 3-4, last paragraph, 2nd line	Larson 2010	References has been updated to read Larson 2010a	Omission
114	Section 6.5.2, 1st paragraph	Larson 2010	Omitted references has been updated to read Larson 2010a	Omission
115	Section 7, p. 7-2	Larson, Ryan. 2010. Section 208.10. USACE. April 21, 2010. Personal communication regarding application review.	Omitted reference has been updated to read Larson 2010a. Section 208.10. USACE. April 21, 2010. Personal communication regarding application review. New citation added: Larson, Ryan. 2010b. Section 208.10. USACE. May 26, 2010. Personal communication during meeting at Ryan's office to discuss regulatory flow rates from project O&M Manuals and other requirements for Section 208.10 reviews and Encroachment permits.	Omission

APPENDIX E

CDFG Concurrence of FRA's Section 4(f) Finding of *De Minimis* Impact on Camp Pashayan

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

AUG 23 2012

Mr. Charlton H. Bonham, Director
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Subject: Request for Concurrence of Section 4(f) Findings on Camp Pashayan
Merced to Fresno Section, California High-Speed Train System
Fresno, California

Dear Mr. Bonham:

The purpose of this letter is to request your concurrence, as the agency with jurisdiction, with the Federal Railroad Administration (FRA) Section 4(f) finding of *de minimis* impact to Camp Pashayan resulting from the construction and operation of the Merced to Fresno Section of the California High-Speed Train (HST) System (Project), further explained below.

As part of the Project Environmental Impact Report/Environmental Impact Statement (EIR/EIS) process, the California High-Speed Rail Authority (Authority) and FRA are evaluating potential effects of the proposed Project on public lands, parks, and recreational facilities. Section 4(f) of the U.S. Department of Transportation Act (49 U.S.C. 303) applies to transportation projects and protects publicly owned public parks, recreation areas, wildlife and waterfowl refuges and any land from a historic site of national, state, or local significance.

Under Section 4(f), an operating administration of the U.S. Department of Transportation, in this case FRA, may not approve a project that uses protected properties unless there are no prudent or feasible alternatives and the project includes all possible planning to minimize harm to such properties[1]. "Use" of a property can be permanent, temporary or constructive. Effects can also be determined to be *de minimis*. In the case of a park or ecological reserve, effects may be determined *de minimis* if, after opportunity for public review and comment, FRA finds that a transportation project will not adversely affect the activities, features, and attributes qualifying the property for protection under Section 4(f) after mitigation, and the officials with jurisdiction over the park or ecological reserve concur with the finding.

[1] Section 4(f) requires the selection of an alternative that avoids the use of Section 4(f) property if that alternative is deemed feasible and prudent. While no entire alignment meeting these criteria avoided the use of Section 4(f) resources, FRA and the Authority did consider alignments that would avoid effects to Camp Pashayan. Design criteria limiting curve radii in order to maintain design speeds, Project objectives such as following existing railroad rights-of-way and minimizing the number of roadway and property impacts, minimizing effects on the San Joaquin River, and consideration of the Project implementation schedule are reasons why these avoidance alternatives were not feasible and prudent. Section 4.8.1.4 of the Project's Final EIR/EIS contains additional details and illustrations of the alignments that were considered to avoid Camp Pashayan.

FRA and the Authority presented preliminary findings of potential effects to Camp Pashayan in the Draft EIR/EIS published in the Fall of 2011. Your agency provided feedback on the draft environmental document on October 13, 2011. The Final EIR/EIS reflects your feedback as well as subsequent coordination with your office regarding the 4(f) *de minimis* finding to Camp Pashayan (see http://www.fra.dot.gov/rpd/freight/fp_California_HST_%20Merced_to_Fresno.shtml or http://www.cahighspeedrail.ca.gov/final-eir-m-f.aspx). Following this work with your office, FRA and the Authority published our findings of *de minimis* effect to Camp Pashayan in the Final EIR/EIS indicating FRA would continue to work with the California Department of Fish and Game (CDFG) regarding the effects to this resource, and include the final determination in FRA's Section 303 finding, anticipated for inclusion in our forthcoming Record of Decision (ROD).

Camp Pashayan

Size and Location
Camp Pashayan, shown in the attached vicinity map, is 31 acres in size and is located in the far northwestern part of the City of Fresno along the southern banks of the San Joaquin River; the park is bordered on its south by the Union Pacific Railway Company (UPRR) tracks and SR 99. Camp Pashayan is considered part of the larger San Joaquin River Ecological Reserve (which is designated as an ecological reserve under California Code of Regulations, Title 14, Division 1, Section 1, Chapter 11, Section 630).

Ownership
The CDFG owns the San Joaquin River Ecological Reserve of which Camp Pashayan is a part, and the San Joaquin River Parkway and Conservancy Trust manages the Camp Pashayan site.

Usage of Park (Intended; Actual/Current; Planned)
Camp Pashayan is managed to provide protection for native plants, wildlife, and aquatic organisms and utilized for various recreational purposes. Park amenities include mature riparian habitat, picnic areas, fishing and boating access, a vehicle parking area, and nature trails.

Unusual Characteristics Reducing or Enhancing Park Value
Camp Pashayan's value is enhanced by its role as part of the greater San Joaquin River Ecological Reserve and the wildlife habitat in the area.

Access
Camp Pashayan is accessible via vehicle, bicycle, or foot from N. Weber Avenue.

Relationship to Similarly Used Lands in Vicinity
As noted, Camp Pashayan is part of the greater San Joaquin River Ecological Reserve. It has been established to provide protection for native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitats. As such, the preservation and enhancement of natural habitat is a major objective for the Ecological Reserve, as is the continuation of compatible public entry and recreational use opportunities for visitors.

Camp Pashayan Use Assessment:

All three potential Project alternatives (UPRR/SR 99, BNSF, and Hybrid) would require approximately 0.6 acre of the San Joaquin River Ecological Reserve property at Camp Pashayan to install piers for elevating the guideway (this acreage impact value reflects a "worst-case" scenario and includes the entire park area under the elevated guideway). The area of land required for the Project represents approximately 2% of the Camp Pashayan total area. The Authority would acquire a real property interest in the San Joaquin River Ecological Reserve which would occur along the southern boundary of Camp Pashayan and would not bisect Camp Pashayan or the larger San Joaquin River Ecological Reserve.

The area to be used for the Project does not include active recreational uses, nor would the boat launch and picnic shelters be affected by any of the HST alternatives. The Project would not affect existing or restored high-value habitat areas. Restoration on the property, including planting of native vegetation, did occur in the late 1990s. While much of the vegetation is now mature and thriving, the property is not actively managed for restoration beyond periodic monitoring activities. For these reasons and with the mitigation measures described below, the construction and operation of the Project would not diminish the characteristics or attributes that make the property eligible for protection under Section 4(f).

The HST guideway would be approximately 60 feet high above the park and would be 50 feet wide; the HST alignment has been designed to be as close to the Union Pacific Railroad (UPRR) corridor as possible within prescribed design criteria. Until the replanted vegetation matures, the HST alternatives would result in a visual change to Camp Pashayan as it would decrease the visual buffer from the adjacent UPPR right-of-way and create additional shading from the elevated structure. However, the guideway would be consistent in height and appearance with the existing bridges (SR 99 and UPRR) that cross the San Joaquin River, although it would be separated from the UPRR corridor by approximately 125 feet. The area between the HST guideway and the UPRR elevated guideway may be available for use after construction, per the Authority's policy on air-rights consistent with restrictions related to HST operations, maintenance, as well as FRA's Office of Safety and the Department of Homeland Security.

User access to Camp Pashayan would remain largely the same during construction with the exception of boater, fishing, and other recreational user river access in a small area within the construction zone. The construction zone includes a temporary easement of 40-50 feet from the HST guideway that will serve as a buffer between the construction activities and users of the park. The Authority will work with the design/build contractor and your office to ensure that construction worker-use of Camp Pashayan facilities are minimized and any CDFG management and maintenance resources are compensated (see mitigation measures).

A temporary access road will be constructed from the staging area (on the east side of Camp Pashayan and outside its boundaries) in order to build the first bridge foundation on the south side of the river. Access to the staging area is through a permanent maintenance easement from N. Weber Ave. to the staging area. This permanent easement will provide future access to the HSR alignment in this area for maintenance and repair.

Construction activities at Camp Pashayan are planned to take place within the temporary construction easement and the UPRR right of way line, and would be sequenced in a manner to avoid blocking access to the work areas; thereby avoiding the need for additional construction access points. The temporary access easement on APN-504-130-22T is +/-50 ft. by 480 ft. and is +/- 0.551 acre. This parcel in Camp Pashayan is owned by the State of California. This temporary impact will be addressed in the Work Plan developed by the design/build contractor, and in the described mitigation below. The Work Plan will also include a schedule of all construction activities. The sequence of work activities will be determined during final design with input from the design/build contractor. The Authority will ensure those portions of the Plan dealing with Camp Pashayan construction activities are approved by CDFG prior to the start of construction. See attached Exhibit for an illustration of construction areas, including easements and access.

All construction equipment, concrete trucks, and deliveries would occur from N. Weber Ave to the staging area and moved from there along temporary access roads as described. Precast deliveries will also come in from this location and staged from the designated staging area. Precast erection will take place by crane from the temporary access roads within the alignment and sequenced to avoid blocking public access.

Mitigation:

Mitigation to lessen the effects described above includes the following:

- Screen stockpiled material and construction excavations through the use of temporary construction barriers and other screens, where they are exposed to park users.
- Restore affected portions of the property after construction and use native plant materials for revegetation where appropriate.
- The temporary impact of +/- 0.551 acre in the temporary easement described above will be restored in place, to its natural state before construction. This restoration plan will be developed and described in the work plan prepared by the contractor and approved by CDFG.
- Use construction best management practices (BMPs) to control dust, visual change, and noise. Coordinate construction activities to avoid scheduled weekend activities, when appropriate. For example, existing access entry points to Camp Pashayan will remain open during construction, since Project construction would occur along the southern boundary of the property and vehicle/bicycle/pedestrian access entry points are well north of the construction zone; visitors would continue to be able to access Camp Pashayan as they do currently. Only the southern end of Camp Pashayan in the construction zone would be access-restricted during construction.
- FRA will work with the Authority to ensure that CDFG is fully compensated for the permanent loss of any land, whether by way of acquisition of available sites along the San Joaquin River, or other comparable mitigation.
- If any additional CDFG management and maintenance resources are needed to accommodate the work, such as use of public restrooms, or on-site assistance, CHSRA will commit to provide compensation for those resources.
- Coordinate with the CDFG to plan for using the area under the elevated tracks as available Ecological Reserve land, contingent upon consistency with the Authority's policy on air-rights with restrictions related to HST operations and maintenance, as well as approval/acceptance by FRA Office of Safety and the Department of Homeland Security.

Mitigation such as that identified above is necessary to support a finding that implementation of Project will not diminish the characteristics or attributes that make Camp Pashayan eligible for protection under Section 4(f). However, additional measures to protect fish and wildlife resources and to avoid, minimize, and fully mitigate the impacts of the Project may also be required to satisfy regulatory requirements applicable to Project-related activities at Camp Pashayan and elsewhere. Such requirements may include, but are not necessarily limited to, those pursuant to Fish and Game Code section 1600 et seq. and the California Endangered Species Act, Fish and Game Code Section 2050, et seq. Furthermore, the Authority adopted mitigation measures on May 3, 2012, as part of its approval of the Project to mitigate impacts to wetland and riparian habitats. These measures are identified in the Mitigation Monitoring and Reporting Plan (MMRP) and will be implemented and monitored as part of Project construction. FRA's forthcoming ROD and Mitigation Monitoring and Enforcement Plan (MMEP) will include the same measures.

In summary, implementation of the Project, with proposed mitigation measures, will not adversely affect the recreational activities or other features of the ecological reserve that qualify the property for protection under Section 4(f). Consequently, the FRA finds that the Project will have a *de minimis* impact to Camp Pashayan, a Section 4(f) property. FRA respectfully requests your consideration of the effects of the Project and the proposed mitigation measures. If you concur with our finding of *de minimis* impact to Camp Pashayan, please sign below documenting your written concurrence as the agency with jurisdiction over this resource.

The California Department of Fish and Game, as owner of Camp Pashayan, concurs with FRA's finding of *de minimis* impact to Camp Pashayan, a Section 4(f) resource, as defined in 49 U.S.C. 303(d).

Signature: ______________________ Date: 9/10/12

Charlton H. Bonham
California Department of Fish and Game

If you would like additional information or would like to meet in person to discuss the Project and the Section 4(f) findings, please contact Jeff Abercrombie, the Authority's Area Program Manager for Merced – Bakersfield, who can be reached at jabercrombie@hsr.ca.gov or by phone at (559) 801-1164, or contact Melissa DuMond with the Federal Railroad Administration via email at melissa.dumond@dot.gov, or by calling (202) 493-6366.

Sincerely,

David Valenstein
Chief, Environment and Systems Planning Division

Enclosure(s): vicinity and construction detail maps of Camp Pashayan

cc:
Mark McLoughlin, California High-Speed Rail Authority
Tom Gibson, Chief Counsel, CDFG
Nancy Templeton, Counsel, WCB
Annee Ferranti and Julie Vance, CDFG, Region 4