Appendix A - CEQA Checklist

Supporting documentation of all CEQA checklist determinations is provided in Chapter 2 of this Initial Study/Environmental Assessment. Documentation of "No Impact" determinations is provided at the beginning of Chapter 2. Discussion of all impacts, avoidance, minimization, and/or compensation measures under the appropriate topic headings in Chapter 2.

This checklist identifies physical, biological, social and economic factors that might be affected by the proposed project. In many cases, background studies performed in connection with the projects indicate no impacts. A NO IMPACT answer in the last column reflects this determination. The words "significant" and "significance" used throughout the following checklist are related to CEQA, not NEPA, impacts.

Environmental Significance Checklist

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?			X	
II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?				X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?				X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?				X
d) Expose sensitive receptors to substantial pollutant concentrations?				X
e) Create objectionable odors affecting a substantial number of people?				X
IV. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		X		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		X		
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?				X
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?				X
VI. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				X
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				X
VII. HAZARDS AND HAZARDOUS MATERIALS -Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X
VIII. HYDROLOGY AND WATER QUALITY –Would the project:				
a) Violate any water quality standards or waste discharge requirements?				X
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?				X
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?				X
f) Otherwise substantially degrade water quality?				X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
IX. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				X
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X
X. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. NOISE – Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?				X
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X
XII. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X
XIII. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS – Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X
XVII. MANDATORY FINDINGS OF SIGNIFICANCE –				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				X
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?				X

Appendix B. Title VI Policy Statement

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE DIRECTOR
1120 N STREET
P. O. BOX 942873
SACRAMENTO, CA 94273-0001
PHONE (916) 654-5266
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Flex your power!
Be energy efficient!

January 14, 2005

TITLE VI
POLICY STATEMENT

The California Department of Transportation under Title VI of the Civil Rights Act of 1964 and related statutes, ensures that no person in the State of California shall, on the grounds of race, color, national origin, sex, disability, and age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity it administers.

WILL KEMPTON
Director

"Caltrans improves mobility across California"

Appendix C – Minimization and Mitigation Summary

Visual/Aesthetics

Minimization measures for the retaining walls:

- Application of context sensitive wall texture and color treatment to reduce visual contrast and reflectivity, and enhance compatibility of visual character to the greatest extent feasible.
- For the median shoulder slippage wall, appropriate wall texture is likely to differ from that selected for ,uphill walls, therefore, wall texture will be selected to blend with the highway, and to minimize reflectivity, glare, and overall color contrast of the wall.
- Careful and optimal selection of wall color and value to minimize wall contrast in both summer and winter conditions.
- Restriction of grading and grubbing beyond wall to no more than 5 feet wherever feasible.
- Walls will not have gutters or chain-link safety fencing in order to reduce visual contrast.
- Minimization of overall wall height to the greatest extent feasible.
- Supervision by the Department during wall texturing.

Minimization measures for the RSP wire mesh revegetation:

- Application of hydroseeded revegetation, using seed mix to blend with the surrounding existing grassland setting.
- Wire mesh will be selected to match color and value of underlying substrate to the greatest feasible extent, i.e. light-colored mesh to cover light colored substrate, and dark mesh to cover dark substrate.

Minimization measure for shrub re-vegetation:

- Hydroseeded re-vegetation of all areas of disturbed soil surfaces from repair of the median shoulder slip, utilizing a seed mix that includes native shrub species to replace and enhance shrub cover lost to shoulder slip/wall construction.

Minimization measure for contour grading and slope rounding:

- Contour grading and slope rounding at slope transitions to minimize the artificial, engineered appearance of resulting slopes and to blend with the natural topography to the greatest feasible extent.

General minimization measures for construction:

- Unsightly material and equipment storage and staging will not be visible within the foreground of the highway corridor to the extent feasible. Where such siting is

unavoidable, material and equipment will be visually screened where feasible to minimize visibility from the roadway and nearby sensitive off-road receptors.

- Construction, staging, and storage areas will be screened where feasible by visually opaque screening wherever they will be exposed to public view for extended periods of time.

- Construction activities will be phased to minimize the duration of disturbance to the shortest feasible time.

- All areas disturbed by construction, staging, and storage will be re-vegetated per the re-vegetation minimization measure noted above.

- Construction activities will limit all construction lighting to within the area of work and avoid light trespass through directional lighting, shielding, and other measures as needed.

Hazardous Waste

The site investigation report will provide recommendations for the safe management of hazardous substances within this project's footprint.

Per the Department's standard requirement, the contractor will prepare a project specific lead compliance plan (LCP) to prevent or minimize worker exposure to lead contaminated soil. The plan will include protocols for environmental and personnel monitoring requirements for personal protective equipment and other appropriate health and safety procedures for the handling of lead-impacted soil.

Air Quality

To minimize air quality impacts from construction activities, control measures as specified in the Environmental Stewardship section of Department Standard Specifications - Section 14-9.01 Air Pollution Control and Section 14-9.02 Dust Control will be implemented.

The California Air Resources Board through its Diesel Risk Reduction Program has implemented, and will implement additional, control measures that affect the construction phase of the project. These include: truck idling limitations, stationary and portable engine emission control programs, accelerated low-sulfur fuel availability, public vehicle fleet accelerated retrofit and replacement regulations, (pending) private truck fleet regulations, and (pending) off-road equipment fleet accelerated retrofit and replacement regulations. This program will provide reduction of risks to public health through the reduction of construction and operational emissions.

Noise

Implementation of the following measures would minimize the temporary noise effects from construction:

- All equipment will have sound-control devices that are no less effective than those provided on the original equipment. No equipment will have an un-muffled exhaust.

- As directed by the Department, the contractor will implement appropriate additional noise minimization measures, including: changing the location of stationary construction equipment, turning off idling equipment, rescheduling construction activity, notifying adjacent residents in advance of construction work, and installing acoustic barriers around stationary construction noise sources.

Water Quality

Best Management Practices (BMPs) and design elements of the project will be documented to demonstrate that project construction and operation will have minimal or no impact to existing water quality in Mountain House Creek and Altamont Creek.

The Department's Storm Water Coordination Branch will assess potential water quality impacts of the project alternatives through geometric design and investigate the potential incorporation of permanent treatment BMPs into the project to reduce the discharge of pollutants during and after construction to the Maximum Extent Practicable. These BMPs fall into three categories: Temporary Construction Site BMPs (BMPs that are applied during construction activities to control sedimentation, erosion, and the discharge of other pollutants), Permanent Design Pollution BMPs (BMPs to improve water quality by reducing erosion, stabilizing disturbed soil areas, and maximizing vegetated surfaces), Permanent Treatment BMPs (BMPs to receive storm water run-off from traveled ways and to treat prior to discharging beyond the highway ROW), and Maintenance BMPs.

The proposed project is not exempt from incorporating permanent Treatment BMPs. The Department's approved permanent treatment BMPs include: biofiltration systems (biofiltration strips and swales), infiltration basins, detention basins, traction, sand traps, dry weather flow diversions, media filters, gross solids removal devices, multi-chamber treatment trains and wet basins.

Hydro-modification requirements for this project may be met with the implementation of volume-based flow control structures, such as underground pipes and above ground basins with specially designed outlet structures. The project may also consider meeting hydro-modification requirements through the use of treatment controls that reduce flow rates by infiltration or evapotranspiration, such as bioswales.

Geology/Soils/Seismic/Topography

The catchment area for rocks falling from the steep high cut slopes will be removed during the project construction, and there will not be sufficient room to create a new catchment area. Therefore, the rock slope protection (RSP) measures of anchored wire mesh and drapery will be implemented.

Biological Resources

The Department will incorporate construction Best Management Practices (BMPs) and general avoidance and minimization measures into the proposed roadway construction project to reduce effects to sensitive biological resources. These measures will be communicated to the contractor via special provisions included in the bid package. General avoidance and minimization measures for biological resources include:

1. A qualified biologist will conduct preconstruction surveys in and around the project footprint to determine presence of sensitive animal species. In the event that

occupied burrows, nests, dens, or other habitats are found, the biologist will request a buffer be placed around the site to minimize disturbance or relocate the animal, in accordance with project permits and in consultation with the CDFG or the USFWS.

2. A qualified biologist will conduct an employee training program on the biology and ecology of sensitive species and habitats found in the project area and laws protecting these resources. The training will be provided to all construction personnel. The training will include materials describing sensitive resources, resource avoidance, permit conditions, and possible fines for violations of state or federal environmental laws. The program will cover the project's mitigation measures, environmental permits, and regulatory compliance requirements. Additional training will be conducted as needed including morning "tailgate" sessions to update crews as they advance into sensitive areas. In addition, a record of all personnel trained during the project will be maintained and made available for compliance verification.

3. Before construction activities begin, the contractor, in consultation with the biologist and in accordance with the project plans, will clearly demarcate environmentally sensitive areas (ESAs) in accordance with permit requirements.

4. The limits of the construction area will be clearly marked. Before commencing construction activities, the contractor will define construction vehicle parking areas and all access.

5. A qualified Biological Monitor will be present during all ground disturbing construction activities.

6. Vegetation will be removed between September 1st and January 31st, outside of the bird-nesting season, to the maximum extent practicable. If this is not possible, the nest avoidance requirements of the MBTA and CDFG Code will be observed.

7. Vegetation removal and cut-and-fill operations will be limited to the minimum necessary. Trees, snags, shrubs, other vegetation, and woody debris will be protected to the extent possible.

8. Silt fencing or other erosion control measures will be installed to prevent sediment and pollutant discharges to state and federal waters and wetlands.

9. Temporary erosion control measures will be implemented on all disturbed areas.

10. Permanent erosion control measures will be implemented upon completion of construction. All disturbed areas will be revegetated with appropriate native, non-invasive species or non-persistent hybrids that will serve to stabilize site conditions.

11. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared by the Department or a subcontractor and will be implemented to minimize water pollution during project construction.

12. All material stockpiling and staging areas will occur within the project ROW in non-sensitive areas or at designated disturbed/developed areas outside of design construction zones.

13. Any borrow material will be certified to be non-toxic and weed free.

14. To eliminate attracting predators of protected species, all food-related trash items such as wrappers, cans, bottles, cigarette butts, and food scraps will be disposed of in solid, closed containers (trash cans) and will be removed at the end of each working day from the entire construction site.

15. Maintenance and refueling areas for equipment will be a minimum of 100 feet from active stream channels and drainages on designated disturbed/developed areas where accidental spills can be immediately contained.

16. Spill containment kits will be maintained on-site at all times during construction operations and/or staging or fueling of equipment.

17. Construction crews will be informed during the education program meeting 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.

18. To the extent possible, nighttime construction will be minimized to avoid effects to federally listed nocturnal species.

19. To reduce the spread of invasive non-native plant species and minimize the potential decrease of palatable vegetation for wildlife species, the Department will comply with Executive Order 13112.

20. In the event that high- or medium-priority noxious weeds are disturbed or removed during construction or construction-related activities, the contractor will contain the plant material associated with these noxious and dispose of it in a manner that will not promote the spread of the species. Areas where noxious weeds are disturbed or removed will be immediately replanted with fast-growing native grasses or a native erosion control seed mixture. If seeding is not possible, the area will be covered with heavy black plastic solarization material until the end of the project.

In addition, specific avoidance, minimization and mitigation measures have been identified to specific biological resources, and are outlined in this section.

Wetlands and Other Waters

Avoidance and Minimization Measures

The proposed project plans will have minimal effects to wetlands or "other waters of the U.S." and "waters of the State" to the greatest extent possible through implementation of Department BMPs, schedule of construction, work during peak low flows (June 15th to October 15th) and incorporation of applicable water quality measures during the construction period The Department will install ESA fencing to delineate protected areas and to restrict workers and equipment to the designated construction areas.

The following additional measures will be implemented to minimize water quality effects:

Control Erosion - Silt fencing (or filter fabric) will be used to contain any short-term erosion or sedimentation that may inadvertently occur. Measures may include but are not limited to the use of sediment basins, hay bales, and silt fences.

Construction Window - Work within identified "other waters of the U.S." (OWUS) and "waters of the State" will be conducted during the dry season (April 15th to October 15th). Extension of this work window is dependant on weather and consultation with the SWRCB and the USACE. Work may continue within these areas on a weekly basis if no rain is forecasted.

The palustrine wetland feature is within the temporary impact area of the project. Effects to this wetland are considered permanent because it would not be restored within one year of construction. The wetland is located along a hillside that will be cut as part of the road widening. Wetland features may redevelop in the area with time, but restoration will not occur within one year.

Compensatory Mitigation

The permanent effects to 0.05 acres of palustrine emergent wetlands may be mitigated at a 3:1 ratio, or 0.15 acres. The mitigation would occur through development of on- or off-site mitigation plans that may include restoration, enhancement, or creation and may consist of purchasing of credits from a USACE or SWRCB approved wetland mitigation bank. Due to the minimal nature of this effect, mitigation will be achieved on-site through the conversion of concrete lined drainages to vegetated drainages. This mitigation will be developed potentially as part of the Section 404 application subject to review and approval by the USACE, or as part of the Stormwater Pollution Prevention Plan (SWPPP) and Section 401 permit application that are both subject to SWRCB review and approval.

The effects to OWUS will be temporary in nature and mitigated on-site with the restoration of temporarily disturbed drainage channels. These features provide little function and value during the dry season and therefore are expected to be unaffected by the project. Due to the implementation of avoidance and minimization measures, no indirect effects to waters outside of the project footprint are anticipated, and therefore, no mitigation is proposed for these features.

Big tarplant, Diamond-petaled California poppy, Stinkbells, Chaparral ragwort, Caper-fruited tropidocarpum

Avoidance and Minimization

- No herbicides, pesticides, or fertilizers will be applied within 50 feet of areas that are occupied by any of these species located on-site.
- Disturbance of potential habitat will be avoided, to the maximum extent possible.
- No sod-forming or non-native invasive plants will be planted.
- Topsoil that is disturbed during construction will be, when possible, replaced to promote the survival of any dormant seeds of these species that may be present within the seed bank.

American badger, San Joaquin kit fox (SJKF)

Avoidance and Minimization

Procedure for an on-site occurrence or encounter with an American badger or San Joaquin kit fox (SJKF) during construction includes the following protocol:

- All work that could result in direct injury, disturbance, or harassment of the individual animal will immediately cease.
- The resident engineer will be immediately notified.
- The resident engineer will notify the approved on-site biologist.
- The animal will be allowed to leave the site voluntarily, and the biologist will contact the USFWS and CDFG within 24 hours.
- If an American badger/SJKF has been killed or injured, the biologist will contact the USFWS and CDFG within 24 hours.

Entrapment avoidance - To prevent inadvertent entrapment of the American badger/SJKF during construction, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered with plywood or similar materials at the end of each working day. Holes or trenches will have one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If, at any time, a trapped American badger/SJKF is discovered, the USFWS and CDFG will be contacted for guidance. The USFWS shall be notified within one working day by telephone or email.

Capping/Inspection of pipes - Because the American badger/SJKF is attracted to den-like structures, such as pipes, and may enter stored pipes and become trapped, all construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected for the American badger/SJKF before the pipe is subsequently buried, capped, or otherwise used or moved in any way. Any American badger/SJKF found in a pipe or culvert shall be allowed to escape unimpeded.

San Joaquin kit fox (SJKF)

Compensatory Mitigation

All temporary and permanent effects to suitable dispersal and migration habitat will be mitigated because the presence of the SJKF is inferred throughout the BSA. The Department proposes to mitigate for the temporary and permanent effects to dispersal and migration habitat for this species.

Permanent effects would be mitigated at a 3:1 ratio, or 0.96 acres. Temporary effects would be mitigated at a 1.1:1 ratio, or 17.45 acres. Approximately 15.86 acres (1:1 ratio) of the temporary effects will be mitigated on site through the restoration of the on site habitats following construction. The remaining 1.59 acres (or 0.1:1 ratio) for temporary effects and 0.96 acres (3:1 ratio) for permanent effects will be mitigated at an off-site location to be

determined through consultation with the USFWS. Total off-site mitigation for the SJKF will be 2.55 acres. Total on-site and off-site mitigation for the SJKF will be 18.41 acres.

Burrowing owl

Avoidance and Minimization

Burrowing owl preconstruction surveys will be conducted by a qualified biologist in accordance with CDFG's *Staff Report on Burrowing Owl Mitigation* (CDFG 1995) and the California Burrowing Owl Consortium's *Burrowing Owl Survey Protocol and Mitigation Guidelines* (CBOC 1993) within 30 days prior to the start of construction.

Preconstruction surveys, consisting of winter season surveys (between December 1st and January 31st) and nesting season surveys (between April 15th and July 15th), will be conducted along the BSA and within a 500 foot buffer, where possible, to identify and map active burrowing owl burrows. Surveys will consist of walking transects of no more than 100 feet apart.

Occupied burrows will not be disturbed during the nesting season (February 1st through August 31st) unless a qualified biologist approved by CDFG verifies through noninvasive methods that either: (1) the birds have not begun egg-laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

If burrowing owls are detected in the project footprint area or within 500 feet, a non-disturbance buffer will be established within a 160-foot radius surrounding occupied burrows during the non-breeding season (September 1st through January 31st) or within a 250-foot radius surrounding occupied burrows during the breeding season of February 1st through August 31st.

If avoidance is not feasible and owls must be moved away from the disturbance area, passive relocation techniques (as described below) will be used rather than trapping. At least one full week will be necessary to accomplish this and allow the owls to acclimate to alternate burrows.

- Passive Relocation - With One-Way Doors

  Owls will be excluded from burrows in the immediate impact zone and within a 160 feet buffer zone by installing one-way doors in burrow entrances. One-way doors (e.g., modified dryer vents) will be left in place 48 hours to insure owls have left the burrow before excavation. Two natural or artificial burrows will be provided for each burrow in the project area that will be rendered biologically unsuitable. The BSA will be monitored daily for one week to confirm owl use of burrows before excavating burrows in the immediate impact zone. Whenever possible, burrows will be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe will be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.

- Passive Relocation - Without One-Way Doors

  Two natural or artificial burrows will be constructed for each burrow in the project area that will be rendered unsuitable for use by burrowing owl The project footprint area will be monitored daily until the owls have relocated to the new burrows. The formerly occupied burrows may then be excavated. Whenever possible, burrows will be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe will be inserted into burrows during excavation to maintain an escape route for any animals inside the burrow.

Compensatory Mitigation

A minimum of 6.5 acres of foraging habitat (calculated from a 300 feet foraging radius around the burrow) for each pair or unpaired resident bird shall be acquired and permanently protected to offset the loss of foraging and burrow habitat if burrowing owls are detected within the BSA during the nesting or winter season. The protected lands will be adjacent to occupied burrowing owl habitat and at a location acceptable to CDFG. Protection of additional habitat acreagefor each pair or unpaired resident bird may be applicable in some instances.

Existing unsuitable burrows shall be enhanced (enlarged or cleared of debris) or new burrows created (by installing artificial burrows) at a ratio of 2:1 on the protected lands site if destruction of occupied burrows is unavoidable.

The Department shall provide funding for long-term management and monitoring of the protected lands. The monitoring plan will include success criteria, remedial measures, and an annual report to CDFG.

Coast (California) horned lizard

Avoidance and Minimization

A biological monitor will clear the project area prior to the start of all ground disturbing activities to minimize potential effects to this species.

Golden eagle, Loggerhead shrike, Northern harrier, Tricolored blackbird, White-tailed kite

Avoidance and Minimization

A qualified biologist will conduct preconstruction bird surveys no more than two weeks prior to the start of construction for activities occurring during the breeding season (February 1st to August 31st) or during the wintering period (September 1st to January 31st) for sensitive wintering species.

If an active nest or roost is discovered, a non-disturbance buffer will be established at a distance sufficient to minimize disturbance. Buffer size will be determined in cooperation with the CDFG and the USFWS.

A qualified biologist will monitor nests for signs of disturbance if rescheduling work around active nests/roosts of special status bird species is infeasible. Work will cease immediately

and the CDFG and the USFWS will be contacted if it is determined that project activities are resulting in nest/roost disturbance.

San Joaquin whipsnake, California tiger salamander (CTS)

Avoidance and Minimization

A USFWS approved biologist with a valid 10(a)1(A) permit to handle the San Joaquin whipsnake/California tiger salamander (CTS) will conduct a preconstruction survey of the work site 14 days prior to the start of construction activities, including vegetation clearing, grubbing, or other ground disturbance activities. The survey will consist of inspecting all suitable aestivation habitat (i.e., small mammal burrows, fissures) within the area that will be permanently or temporarily affected. If San Joaquin whipsnake/CTS adults or juveniles are found, all work that could result in direct injury, disturbance, or harassment of the individual animal will immediately cease. The biological monitor will contact the USFWS and CDFG to determine whether relocating the species is appropriate. If the agencies approve of relocation, a USFWS approved biologist will be allowed sufficient time to move the species from the work site before construction activities begin. Only USFWS approved biologists may participate in activities associated with the capture, handling, and monitoring of the San Joaquin whipsnake/CTS.

A biological monitor will be on-site during ground disturbing activities to inspect for the San Joaquin whipsnake/CTS that may be unearthed. Should a San Joaquin whipsnake/CTS be identified, construction would be halted, the USFWS would be contacted, and the individual would be located by a permitted biologist prior to restarting construction with USFWS approval.

California tiger salamander (CTS)

Compensatory Mitigation

All temporary and permanent effects to suitable habitat will be mitigated because the presence of the CTS is inferred throughout habitats located in the BSA. There will be 0.37 acres of permanent effects to be compensated for at a 3:1 ratio, which will result in 1.11 acres of mitigation for the CTS. There will be 15.86 acres of temporary and construction effects that will be mitigated at a ratio of 1.1:1 of landscaped/agricultural lands, for a total of 17.45 acres. As per the discussion for CRLF, 15.86 acres of temporarily disturbed area will be restored upon project completion and will be used as on-site mitigation for this species. The remaining temporary and permanent mitigation required off-site is 2.7 acres. Total on-site and off-site mitigation for the CTS will be 18.56 acres.

Western spadefoot toad, California red-legged frog (CRLF)

Seasonal Avoidance - To the extent practicable, construction will not occur during the wet season, when the western spadefoot toad/California red-legged frog (CRLF) is more likely to disperse through upland habitats. Vegetation clearing may be done outside of this period, if necessary, to avoid disturbance to nesting birds.

Preconstruction Surveys - A qualified biologist will conduct a western spadefoot toad/CRLF preconstruction survey of the work site 14 days prior to the start of construction activities, including vegetation clearing, grubbing, or other ground disturbance activities. If western spadefoot toad/CRLF adults, tadpoles, or eggs are found, the biologist will contact the

USFWS and CDFG to determine whether relocating the species is appropriate. If the agencies approve relocation, a USFWS approved biologist will be allowed sufficient time to move the species from the work site before work activities begin. Only USFWS approved biologists will participate in activities associated with the capture, handling, and monitoring of the western spadefoot toad/CRLF.

Construction Area Delineation - Prior to any ground disturbance on the project site, the boundaries of the project area will be clearly delineated with orange-colored plastic high-visibility construction fencing (ESA fencing) or solid barriers to prevent workers or equipment from inadvertently straying from the project area.

Wildlife Exclusion Fencing - Exclusion fencing will be erected along each section of the project area before project activities begin, including staging equipment and supplies. Fencing will be a minimum of 3 feet high and buried in the soil or form a tight seal with the pavement to prevent the western spadefoot toad/CRLF from crawling under and entering the project area.

Procedure for Western Spadefoot Toad Discovery On-site - If a western spadefoot toad/CRLF, or any amphibian that construction personnel believes to be this species, is encountered during project construction, or if any contractor, employee, or agency personnel inadvertently kills or injures a western spadefoot toad/CRLF, the following protocol will be followed:

- All work that could result in direct injury, disturbance, or harassment of the individual animal will immediately cease.
- The resident engineer will be immediately notified.
- The resident engineer will notify the approved on-site biologist.
- The approved on-site biologist will immediately transport the western spadefoot toad/CRLF in a cool, moist container to a suitable location outside the project area (e.g., suitable habitat adjacent to but outside of the BSA). A qualified biologist, in consultation with the USFWS and CDFG, will determine this relocation site in advance. The relocated individual(s) will be monitored until it is determined that predators or other dangers are not imperiling the animal(s).
- The approved on-site biologist will notify the USFWS within 24 hours after the western spadefoot toad/CRLF has been relocated.
- The biologist will contact the USFWS and CDFG within 24 hours if a western spadefoot toad/CRLF has been killed or injured.

Entrapment Avoidance - To prevent inadvertent entrapment of the western spadefoot toad/CRLF or other animals during construction, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered with plywood or similar materials at the end of each working day, or the holes or trenches will contain one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If, at any time, a trapped western spadefoot toad/CRLF or other wildlife is discovered, the USFWS and CDFG will be contacted.

Prohibition of Erosion Control Materials Potentially Harmful to the Western Spadefoot Toad/CRLF - Plastic monofilament netting (erosion control matting) or similar material will not be used at the project site because the western spadefoot toad/CRLF may become entangled and trapped in it. Tightly woven fiber netting or similar material will be used for erosion control or other purposes.

Prevention of Introduction of Amphibian Diseases - Biologists will take all precautions to prevent spread of amphibian diseases when handling the listed species. All equipment and clothing will be disinfected per protocol standards.

Daily Work Area Surveys - The biological monitor will conduct daily surveys along the work area boundaries and will notify the USFWS approved biologist if the western spadefoot toad/CRLF is found within the work area.

California red-legged frog (CRLF)

Compensatory Mitigation

Because the presence of the CRLF is inferred throughout habitats located within the BSA, all temporary and permanent effects to suitable habitat will be mitigated. The Department proposes to mitigate for the temporary and permanent effects to upland habitat for this species. Permanent effects (0.37 acres) will be mitigated at a 3:1 ratio for a total of 1.11 acres. Temporary effects (15.86 acres) will be mitigated at a 1.1:1 ratio, or 17.45 acres. Approximately 15.86 acres (1:1 ratio) will be mitigated on site through the restoration of the temporarily disturbed on-site habitats following construction. The remaining 1.59 acres (or 0.1:1 ratio) for temporary effects and 1.11 acres for permanent effects (a total of 2.7 acres) will be mitigated at an off-site location to be determined through consultation with the USFWS. Total on-site and off-site mitigation for effects to habitat for the CRLF will be 18.56 acres.

Large-flowered fiddleneck

Avoidance and Minimization

- For any FESA listed plant populations that are located during construction, exclusion fences will be installed along the margins of the work area wherever the work area is located 50 feet or less from the avoided plant populations. Fencing will be installed prior to ground-disturbing activities. Avoided plant populations will be clearly marked to prevent inadvertent encroachment into the avoided areas during construction. All fencing will remain in place until all construction activities are completed.

- As recommended by the USFWS, a buffer width of 50 feet will be utilized to protect the FESA listed plant populations at all locations within and adjacent to the BSA.

- No herbicides, pesticides, or fertilizers will be applied within 50 feet of areas that are occupied by any large-flowered fiddleneck located on-site.

- Disturbance of potential habitat will be avoided, to the maximum extent possible.

- No sod-forming or non-native invasive plants will be planted.

- Topsoil disturbed during construction will be replaced, when possible, to promote the survival of any dormant seeds of large-flowered fiddleneck that may be present within the seed bank.

Longhorn fairy shrimp (LHFS), Vernal pool fairy shrimp (VPFS)/Vernal Pool tadpole shrimp (VPTS)

Avoidance and Minimization

Construction of bioswales and the post construction restoration of drainage ditches will minimize effects to the LHFS, VPFS and VPTS. Additionally, the following precautionary measures will be implemented.

- Prior to the disturbance of areas identified as potential habitat for LHFS, the contractor will remove and conserve the top six inches of topsoil within the identified drainages. Upon restoration of these drainages, or construction of bioswales or vegetated drainages of equivalent hydrology, the contractor will restore this soil to the bed of the drainage. The conservation of soil will serve to mitigate effects by conserving cysts of LHFS that can become active following the establishment of an appropriate hydrology regime.

- Work within potential habitat will be limited to the dry season (April 15th to October 15th).

- LHFS habitat will be avoided to the maximum extent possible.

Invasive Species

To reduce the spread of invasive non-native plant species and minimize the potential decrease of palatable vegetation for wildlife species, the Department will comply with Executive Order 13112. In the event that high- or medium-priority noxious weeds are disturbed or removed during construction or construction-related activities, the contractor will contain the plant material associated with these noxious weeds and dispose of it in a manner that will not promote the spread of the species. Areas where noxious weeds are disturbed or removed will be immediately replanted with fast-growing native grasses or a native erosion control seed mixture. If seeding is not possible, the area will be covered with heavy black plastic solarization material until completion of the project.

Specific measures under that general heading could include developing an Invasive Weed Eradication Plan that targeted invasive species on the California Department of Food and Agriculture list, as well as other non-native, invasive species found on-site; preventing disposal of soil and plant materials from any areas that support invasive species into areas that support stands dominated by native vegetation; using only native, non-invasive species or non-persistent hybrids for erosion control will consist of native, non-invasive species or non-persistent hybrids; washing all equipment prior to entering the BSA, and using gravel or fill from weed-free sources.

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Appendix D: List of Acronyms

AADT	Average Annual Daily Traffic
BAAQMD	Bay Area Air Quality Management District
BSA	biological study area
BMP	Best Management Practices
Cal IPC	California Invasive Plant Council
CCA	cross-centerline accident
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CTS	California tiger salamander
CWUS	culverted water of the United States
Department	California Department of Transportation
dbh	diameter at breast height
DPS	Distinct Population Segment
EFH	essential fish habitat
ESA	environmentally sensitive area
FESA	Federal Endangered Species Act
°F	degrees Farenheit
ft	foot/feet
FHWA	Federal Highway Administration
HOV	high-occupancy vehicle
I-580	Interstate 580 freeway
LHFS	longhorn fairy shrimp
MBTA	Migratory Bird Treaty Act
MTC	Metropolitan Transportation Commission
MVZ	Museum of Vertebrate Zoology
NES	Natural Environment Study
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration

NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
OWUS	other waters of the U.S.
PM	post mile
Quad	quadrangle
RCP	Reinforced Concrete Pipe
ROW	right of way
RWQCB	Regional Water Quality Control Board
SHOPP	State Highway Operation and Protection Program
SIP	Steel Inlet Pipe
SJKF	San Joaquin kit fox
SWDR	Storm Water Data Report
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TCIF	Trade Corridor Improvement Funds
TNW	Traditional Navigable Waters
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VPFS	vernal pool fairy shrimp
VPTS	vernal pool tadpole shrimp
VIA	Visual Impact Assessment
WEF	wildlife exclusion fencing

Appendix E: List of Technical Studies

Air Quality Study Report, July 2009

Archaeological Survey Report (ASR), June 2009

Preliminary Geotechnical Report, July 2009

Highway Operational Report, March 2009

Historic Property Survey Report (HPSR), June 2009

Natural Environment Study, October 2009

Traffic Noise Study Report, July 2009

Visual Impact Assessment, May 2009

Appendix F: Public Comment Letters

California Regional Water Quality Control Board

San Francisco Bay Region

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
http://www.waterboards.ca.gov/sanfranciscobay

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

September 14, 2009
CIWQS Place No.: 744555

Sent via electronic mail: No hard copy to follow

Clear 9-24-09 e

California Department of Transportation
Attn: Ed Pang
Ed_Pang@dot.ca.gov
P.O. Box 23660
Oakland, CA. 94623-0660

SUBJECT: **Initial Study and Proposed Mitigated Negative Declaration for the I-580 Eastbound HOV Lane Project (SCH No. 2009082067)**

Caltrans Project No.: EA 4A0700

Dear Mr. Pang:

Thank you for giving San Francisco Bay Regional Water Quality Control Board (Water Board) staff the opportunity to review the *Initial Study with Proposed Mitigated Negative Declaration* (Study) for the Interstate 580 (I-580) Eastbound HOV Lane Project (Project). The Project proposed by the California Department of Transportation (Department) involves the addition of a truck climbing lane in the eastbound direction over Altamont Pass from the Greenville Road interchange in the City of Livermore to approximately one mile east of the North Flynn Road interchange in unincorporated Alameda County. Water Board staff have reviewed the Study and have the following comments.

Post-Construction Stormwater Runoff Impacts

The Department is proposing to add an unspecified area of new impervious surface via Project implementation.

Added impervious areas may result in alterations to existing hydrologic regimes, resulting in erosion and/or changes of sediment transport in receiving waters (hydromodification). The Water Board finds that this project has a significant likelihood of causing hydromodification impacts to receiving waters. Therefore, the Department must characterize the extent project implementation will result in such impacts, and propose mitigation for any significant impacts. At a minimum, for the Project areas in the jurisdiction of the Water Board, the Department shall be subject to the same hydromodification standards as the Municipal Separate Storm Sewer Systems (MS4's) operating under the Alameda County Municipal Stormwater Permit.

The Water Board will require the Department provide treatment of stormwater runoff from new and reconstructed areas of impervious surface. Specifically, the Water Board shall require treatment of stormwater runoff from a Project area equivalent to the area of all new and redeveloped impervious surface. Should it prove infeasible to treat runoff, the Department shall identify alternate treatment in the same watershed that will provide a water quality benefit equivalent to the foregone treatment.

Planning for Provision of Mitigation Areas

As noted in this letter, the Department is subject to hydromodification and post-construction stormwater treatment. Additionally, the Department may be subject to mitigation for permanent impacts to jurisdictional wetlands and waters. Mitigation for these items will likely require the provision of Department right-of-way. The Department must plan for provision of these mitigation lands as soon as possible; should provision and/or acquisition of these on-site lands prove infeasible, the Department must provide the accompanying rationale of infeasibility in its 401 certification application and provide an off-site mitigation proposal to compensate for the foregone on-site mitigation.

If you have any questions, comments, or concerns, please contact me at (510) 622-2506, or via e-mail to BThompson@waterboards.ca.gov.

Sincerely,

Brendan Thompson
Environmental Specialist

cc (via e-mail): State Clearinghouse
Mr. Hardeep Takhar, Caltrans
Mr. Dale Bowyer, SF Bay Water Board
Ms. Melissa Escaron, CDFG
Mr. Hal Durio, USACE
Ms. Andrea Meier, USACE
Ms. Amna Hawatky, State Board
Mr. Bill Orme, State Board

STATE OF CALIFORNIA -- THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

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9.24.09
e

SEP 1 6 2009

Mr. Tom Rosevear
California Department of Transportation
PO Box 23660
Oakland, CA 94623

Interstate 580 Eastbound Truck Climbing Lane Project, Livermore, Alameda County, California, South Bay Aqueduct Pipeline, Approximate Milepost 7.50, Delta Field Division, SCH2009082067

Dear Mr. Rosevear:

Thank you for the opportunity to review and comment on the Interstate 580 Eastbound Truck Climbing Lane near the Community of Livermore. The notice describes the proposal by the California Department of Transportation, to improve the existing roadway for Interstate 580 east of Livermore. The proposed construction zone for Eastbound Truck Climbing Lane will cross the Department of Water Resources' (DWR) California Aqueduct, South Bay Aqueduct Pipeline. DWR's South Bay Aqueduct Pipeline, a buried 72-inch diameter pipeline, traverses Interstate 580 in a southwesterly direction, then parallels Altamont Pass Road heading west.

The proposed road modifications that cross DWR's pipeline may require an Encroachment Permit/Review from DWR prior to the start of any construction near DWR's pipeline. Furthermore, staging of equipment or storage of materials will not be permitted over DWR's pipeline. Information on obtaining an encroachment permit/review from DWR can be viewed at:

http://wwwdoe.water.ca.gov/Services/Real_Estate/Encroach_Rel/index.cfm

Please provide DWR with a copy of any subsequent environmental documentation when it becomes available for public review. Any future correspondence relating to this project should be sent to:

Leroy Ellinghouse, Chief
SWP Encroachments Section
Division of Operations and Maintenance
Department of Water Resources
1416 Ninth Street, Room 641-2
Sacramento, California 95814

In addition, please continue to keep DWR informed of any future actions with respect to the Interstate 580 Eastbound Truck Climbing Lane Project.

If you have any questions, please contact Leroy Ellinghouse, Chief of the SWP Encroachments Section, at (916) 659-7168 or Mike Anderson at (916) 653-6664.

Sincerely,

Original Signed by

David M. Samson, Chief
State Water Project Operations Support Office
Division of Operations and Maintenance

cc: State Clearinghouse
Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, California 95814

223 Donner Avenue
Livermore, CA 94551-4240

19 August 2009

Ed Pang, Environmental Branch Chief
Attention: Tom Rosevear
Department f Transportation, Office of Environmental Analysis
PO Box 23660
Oakland, CA 94623-0660

Re: I-580 EB Truck Climbing Lane Project IS/EA

I have long sought a BART/ACE intermodal station east of Greenville Road and north of I-580. BART would lie in a widened I-580 median to east of Greenville Road, curve left under the elevated westbound I-580 lanes, and enter the now-abandoned SP Altamont line roadbed through the high UP/ACE trestle. The station would lie between I-580 and the high trestle.

A major parking/kiss-ride/bus structure with direct access to and from I-580 over the Altamont would serve this intermodal station for both BART and ACE travelers from the Central Valley. I picture such a structure north of the freeway with a direct entry ramp from westbound I-580 and over the UP. Eastbound the ramp would pretty much follow the former SP roadbed under I-580 and rise directly or loop over the UP to enter eastbound I-580 over the Altamont.

*Please assure that your design would accommodate such a structure and freeway access ramps when BART is extended to Livermore – hopefully to the station I propose.

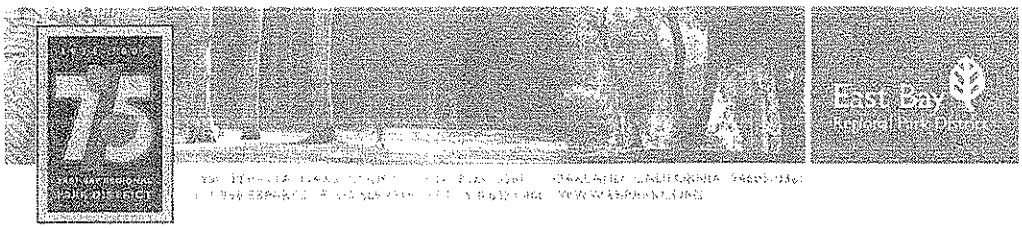
*Please consider also relocating the truck weighing station from the Valley floor east to the top of the Pass. A BART station at the existing truck scales would serve lab commuters with a short shuttle bus ride, and transit-oriented development (TOD) on the site bought by BART for a train yard. (The yard would instead be in the county-owned former SP 400' Congressional Grant right of way beyond the high trestle).

Ultimately BART should extend along the former SP and Old Altamont Pass Road to Mountain House, then on to Tracy, Banta, and a Lathrop/Manteca CAHSR intermodal station. This should cost far less and serve many more people much better than a tunnel under the Altamont, as is being proposed for ACE. (ACE runs four trains each way ***daily***, while BART runs that many ***each hour***; it provides a great commute to the Silicon Valley, but can't begin to provide BART-type service)

I request a public hearing to assure consideration of the asterisked items.

Robert S. Allen
BART Director (1974-1988)
Retired, SP Engineering/Operations
(925) 449-1387

cc: City of Livermore
MTC
BART



September 1, 2009

Ed Pang, Environmental Branch Chief
Attention: Tom Rosevear
Department of Transportation, Office of Environmental Analysis
P.O. Box 23660
Oakland, CA 94623-0660

Subject: Comments on IS/MND for the Interstate 580 Eastbound Truck Climbing Lane Project

Dear Mr. Rosevear,

The East Bay Regional Park District ("District") is providing the following comments on the proposed Project. Our mission includes protecting open space and wildlife corridors, and developing public access facilities, including two planned regional trails in the Project area.

Open Space and Wildlife Corridors

The proposed Project is located about 1,500 feet south of the 1,833-acre Brushy Peak Regional Park (see enclosed map). The Park contains regionally significant populations of special-status species, including San Joaquin kit fox, California tiger salamander, California red-legged frog, western burrowing owl, golden eagle, prairie falcon, long-horn fairy shrimp and San Joaquin spear scale. Brushy Peak also contains significant Native American cultural resources and some potentially historic structures. While these resources are in public ownership, they are not immune to impacts for nearby development projects, including the subject Project.

Wildlife Impacts: Brushy Peak Regional Park and the proposed Project are located within the Altamont Hills. This large grassland provides significant habitat for the above named species. The grasslands are used as migration corridors for terrestrial and avian species. Interstate 580 (I-580) is the most significant terrestrial-species migration barrier in the Altamont Hills. There are very few grade separated crossings under I-580 where wildlife, in particular, the endangered San Joaquin kit fox, can migrate in a north-south direction. It appears that the proposed Project may result in both individual and cumulatively significant impacts to wildlife.

The IS/MND discussion on pages 84-86 provides no substantial evidence of how the project may affect movement of the endangered San Joaquin kit fox in the Project area. The document speculates about potential impacts, but provides no scientific evidence to support a conclusion that the Project will not have significant individual or cumulative significant impacts to kit fox.

The fourth paragraph on page 83 of the IS/MND makes a confusing statement that tiger salamanders may have a movement corridor across I-580 "if the CTS is able to successfully cross the westbound lane". Does this statement suggest that CTS might successfully cross (at

grade) a major Interstate freeway? Are there not five or six west-bound lanes that CTS would need to cross? Recent studies by Contra Costa County have shown that hundreds of CTS and red-legged frog are killed each year on just a two mile segment of Vasco Road. This County road only has two lanes and it has considerably less traffic volume than I-580.

The proposed Project should include mitigation measures for these impacts, including measures to facilitate movement underneath I-580. At the western end of the Project is the Greenville Road Interchange. This is one of the largest grade separated undercrossings in the Project area. Just east of this are smaller railroad and aqueduct undercrossings. Caltrans should implement mitigation measures that protect these undercrossings from further development. Caltrans should also acquire adjacent habitat areas to protect and facilitate wildlife movement under I-580. There may be other opportunities for facilitating wildlife movement in the project area, including North Flynn Road; however, the exhibits enclosed in the IS/MND are difficult to read and we could not determine where other opportunities might be located.

Visual Impacts: The IS/MND incorrectly states on page 20, paragraph 4 that there are "no recreational, residential, or other sensitive land uses are [*sic*] found within the project viewshed". Brushy Peak Regional Park, a public park, is located about 1,500 feet north of the project area. Interstate 580 is clearly visible from the Park. Brushy Peak is located at the northern end of the Park at an elevation of 1,700 feet. It is one of the most prominent natural landmarks in the area. It is located about three miles due north of the Project area. The IS/MND does not address potentially significant visual effects to the Park. This would include cut and fill slopes, retaining walls, pavement, barriers, and increased light and glare.

Noise Impacts: The IS/MND does not appear to contain any discussion or analysis of potentially significant noise effects to the Park. How will potential increases in project-related noise affect park visitors and resident wildlife? This potentially significant effect should be evaluated.

Regional Trails

The District's October 2007 Master Plan map identifies existing and planned regional trails in the East Bay. Two planned regional trails in the Project area may be impacted by the Project.

Brushy Peak to Del Valle Regional Trail: This trail will run south from Brushy Peak Regional Park, underneath the Greenville Road Interchange where it will follow the South Bay Aqueduct to Del Valle Regional Park.

San Joaquin County to Shadow Cliffs Regional Trail: This trail will run west from the San Joaquin County line following a former railroad right of way that roughly parallels Altamont Pass Road. It will also cross under I-580 at the Greenville Road Interchange where it will run west along Stanley Boulevard to Shadow Cliffs Regional Recreational Area.

The project may result in potentially significant effects on the District's ability to construct and operate these planned trail facilities. Any changes to the Greenville Road Interchange should take into consideration the requirements for these trails. An analysis of potential effects to planned trails (and public parkland) should include Section 4(f) of the Department of

Transportation Act. Potential mitigation measures for these potentially significant effects could include acquisition of right-of-way and/or construction of segments of these proposed trails.

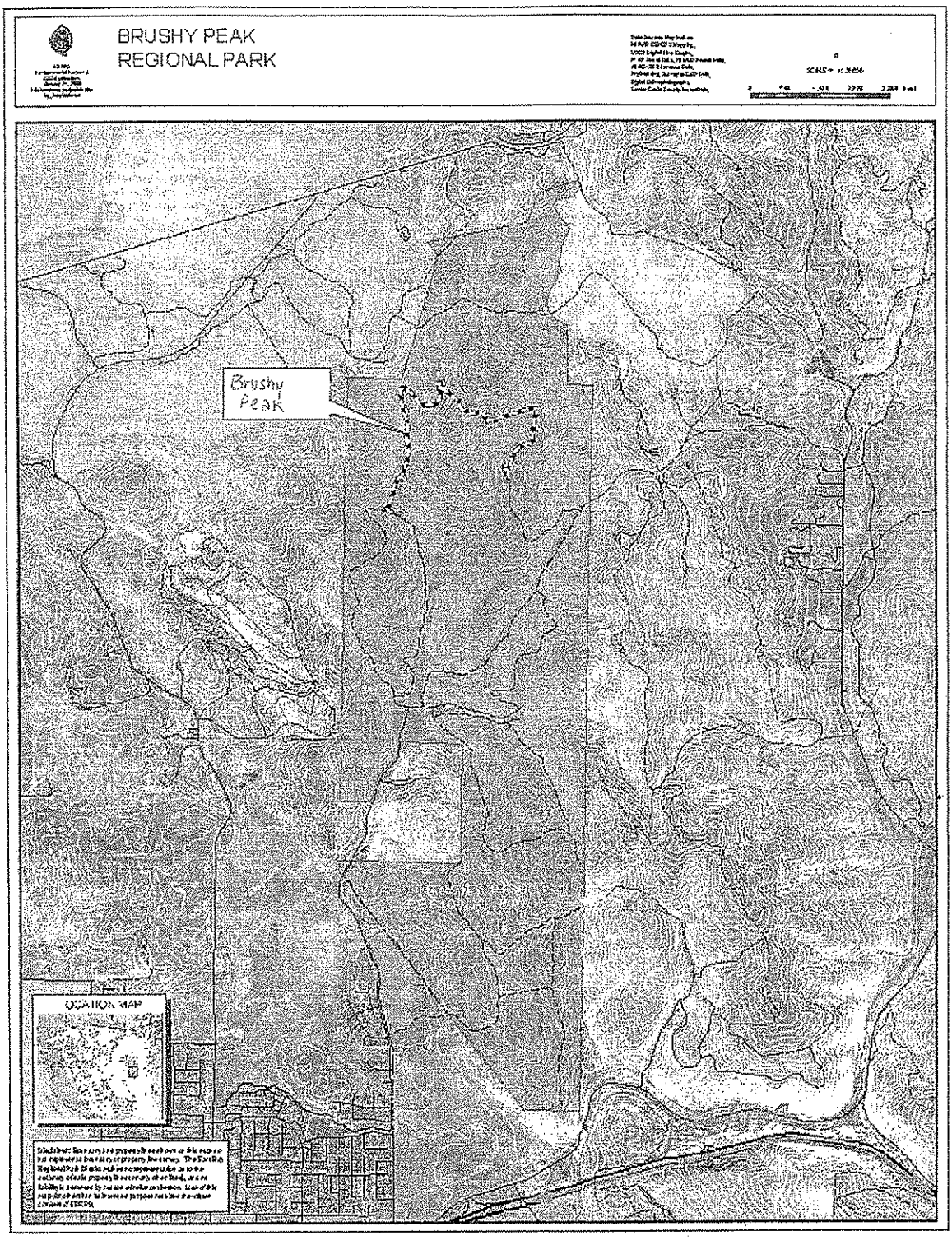
Thank you for considering our comments for the proposed Project. Should you have any questions regarding this letter please call me at (510) 544-2622.

Sincerely,

Brad Olson
Environmental Programs Manager

Enclosures (1)

cc. Jim Townsend, Regional Trails Program Manager


BRUSHY PEAK
REGIONAL PARK
Brushy Peak

Appendix G: U. S. Fish and Wildlife Service Biological Opinion

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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:
81420-2009-F-1287-2

JAN 29 2010

Mr. Jim Richards
Attn: Robert Atanasio
Office of Biological Sciences and Permits
California Department of Transportation
P.O. Box 23660
Oakland, California 94623-0660

Subject: Biological Opinion on the Effects of the Proposed Interstate 580 Eastbound Truck Climbing Lane Project, Alameda County, California (Caltrans EA 4A0700) on the Endangered Large-Flowered Fiddleneck, Endangered Longhorn Fairy Shrimp, Endangered Vernal Pool Tadpole Shrimp, Threatened Vernal Pool Fairy Shrimp, Threatened California Red-Legged Frog, Threatened Central California Tiger Salamander (Distinct Population Segment), and Endangered San Joaquin Kit Fox

Dear Mr. Richards:

This letter responds to a letter from the California Department of Transportation (Caltrans), dated September 17, 2009, which requested formal consultation for the proposed Interstate 580 Eastbound Truck Climbing Lane Project, Alameda County, California. Your letter was received by the U.S. Fish and Wildlife Service (Service) on September 23, 2009. This document represents the Service's Biological Opinion on the effects of the project on the endangered large-flowered fiddleneck (*Amsinckia grandiflora*), endangered longhorn fairy shrimp (*Branchinecta longiantenna*), endangered vernal pool tadpole shrimp (*Lepidurus packardi*), threatened vernal pool fairy shrimp (*Branchinecta lynchi*), threatened California red-legged frog (*Rana aurora draytonii*), threatened California tiger salamander Distinct Central Population Segment (*Ambystoma californiense*), and endangered San Joaquin kit fox (*Vulpes macrotis mutica*) under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation (23 U.S.C. 327) allows the Secretary of the U.S. Department of Transportation (USDOT) acting through the Federal Highway Administration (FHWA) to establish a Surface Transportation Project Delivery Pilot Program, whereby a State may assume the FHWA responsibilities under the National Environmental Policy Act (NEPA) for environmental review, agency consultation and other actions pertaining to the review or approval of a specific project. Caltrans assumed these responsibilities for the FHWA on July 1, 2007 through a Memorandum of Understanding (MOU) within the State of California: http://www.dot.ca.gov/ser/downloads/MOUs/nepa_delegation/sec6005mou.pdf.

Based on the information provided in the September 2009 biological assessment, Caltrans has determined that the project as proposed may affect, but is not likely to adversely affect the large-flowered fiddleneck, longhorn fairy shrimp, vernal pool tadpole shrimp, and vernal pool fairy shrimp. Their determination was based on focused surveys for the large-flowered fiddleneck conducted on May 1, 2009, within the April-May blooming period for this species, which reported negative findings within the BSA. As an additional measure, Caltrans is proposing to conduct a follow-up preconstruction survey for this species and reinitiate consultation if identified within the action area. Caltrans determined that habitat for listed branchiopods is limited to four overgrown drainage ditches at the entrances to stormwater culverts comprising 0.02-acre that may pond water for short durations between storm events; otherwise they are subject to flashy flows unsuitable for branchiopods. No other habitat was identified within the action area that could support listed branchiopods. Based on these reasons, the Service concurs with the not likely to adversely affect determination for the large-flowered fiddleneck, longhorn fairy shrimp, vernal pool tadpole shrimp, and vernal pool fairy shrimp.

This biological opinion is based on: (1) the *Biological Assessment: I-580 Eastbound Truck-Climbing Lane Project* dated September 2009; (2) letter from Caltrans to the Service dated September 17, 2009; (3) project meeting and site visit conducted by the Service and Caltrans on November 10, 2009; (4) miscellaneous correspondence and electronic mail concerning the proposed action between Caltrans and the Service; and (5) other information available to the Service.

Consultation History

September 23, 2009	The Service received correspondence from Caltrans dated September 17, 2009 and a biological assessment for the large-flowered fiddleneck, longhorn fairy shrimp, vernal pool tadpole, vernal pool fairy shrimp, California red-legged frog, California tiger salamander, and San Joaquin kit fox.
November 10, 2009	Jerry Roe of the Service attended a meeting and a site visit with Robert Atanasio and Margaret Gabil of Caltrans to review the project, biological findings, effects determination, project timing and scheduling, and avoidance and minimization measures.
December 21, 2009	The Service issued a letter requesting additional information for completion of the biological opinion.
December 23, 2009	The Service received via email correspondence a response from Robert Atanasio of Caltrans to the Service's December 21, 2009 letter providing the requested information and indicating that Caltrans reviewed and approves of the changes made by the Service to the project description and proposed conservation measures included in the biological opinion.
January 27, 2010	The Service received a letter from Caltrans dated January 21, 2010 addressing additional comments in response to the Service's request for information letter dated December 21, 2009.
September 23, 2009 - January 4, 2010	Electronic and phone correspondence between Robert Atanasio and Margaret Gabil of Caltrans, and Jerry Roe of the Service.

BIOLOGICAL OPINION

Description of the Proposed Action

The following project description, inclusive of the proposed compensation and proposed conservation measures, was provided by Caltrans and is an excerpt from the September 2009 Biological Assessment with minor modifications for reasons of clarity and accuracy provided by the Service.

Project History

I-580 is the major east-west inter-regional corridor and a truck linkage between the San Francisco Bay Area (Bay Area) and the Central Valley as well as a major route serving the Tri-Valley area, which includes the cities of Pleasanton, Dublin, and Livermore. It is a principal artery for the movement of goods, freight, and people in and out of the region. I-580 is a major farm-to-market route for agricultural products as well as a significant recreational route providing access between the Bay Area, the Central Valley, and the Sierra area throughout the year.

In the Metropolitan Transportation Commission (MTC)'s Transportation 2030 Plan for the San Francisco Bay Area, more than 80 percent of goods movement in the Bay Area involves trucking in several major corridors – Interstate 880, U.S. Highway 101, Interstate 80, and I-580. In these corridors, which rank among the most congested in the Bay Area, trucks compete with other vehicles for scarce lane space. The high volume of truck traffic using I-580 through Altamont Pass area indicates this corridor is a significant component of the State and the Bay Area economies, and efforts should be made to ensure reasonable mobility for the trucking industry.

Congestion in the I-580 corridor is attributed to heavy commuter traffic during the weekdays. An increase in congestion and delay is expected, along with projected growth in the region. The MTC travel projections show that commutes to and from the Bay Area will nearly double over the next 20 years. One of the largest increases in commuter traffic will be from growth in the Central Valley, especially in San Joaquin, Stanislaus, and Merced counties.

The purpose of this project is to enhance the movement of goods between the Bay Area and the Central Valley. The addition of the truck-climbing lane will improve freeway safety and operations to eastbound I-580 corridor and reduce congestion during peak traffic periods. The need for this project is to improve freeway safety and operations, reduce recurrent traffic congestion and delay during peak traffic period as a result of the diversion of slow-moving truck traffic from the mixed-flow lanes traffic, and separate traffic weaving movements from the mainline.

Project Description

The proposed project is on I-580 over the Altamont Summit, just east of Livermore, California (CA). The limits are one-mile east of North Flynn Road (PM 4.9) to the Greenville Road undercrossing (PM 8.2) in the city of Livermore within Alameda County. This project lies within the northeastern corner of the United States Geologic Survey (USGS) 7.5-minute Altamont topographic quadrangle (quad) map. This project will provide safety and operational improvements and reduce recurrent traffic congestion and delay during peak traffic periods by separating slow-moving truck traffic from the existing mixed-flow lane traffic. Funding for this

project is proposed from the State Highway Operation and Protection Program (SHOPP) portion of the Trade Corridor Improvement Funds (TCIF). Project elements include:

- Inside and outside shoulder reconstruction and widening;
- Construction of three retaining walls, upgrade of traffic safety elements;
- Modifications of existing drainage facilities;
- Slide slope repairs between PM 4.8 and PM 5.6;
- Culvert extensions as necessary so they will reach beyond the southern edge of the pavement (no increased flow capacity is anticipated); and
- Bioswales/detention areas installed where necessary (the culvert extensions and bioswales will be located within the project footprint).

The proposed construction is expected to be conducted from within the existing Caltrans right-of-way (ROW). A floodplain study will be conducted prior to the drainage design.

Biological Study Area (BSA)

The biological study area (BSA) is the area evaluated in the field for potential effects to natural resources from the proposed roadway project. It includes the project footprint area and extends beyond the footprint to account for any project design changes that could result in changes to the footprint boundaries. Areas outside of the BSA are reviewed by URS biologists using literature and database searches in order to identify species that could enter the project footprint during construction.

Construction Activities

Shoulder and lane widening will require excavation and fill to develop new surface for the expanded shoulder and lane. The shoulders will be graded and compacted with graders, rollers, and water trucks to prepare for paving. The existing pavement will be saw cut and the new pavement expanded outward from the cut. Asphalt emulsion will be applied to the saw cut edge and asphalt concrete paving machines will place pavement to the design edge of pavement with a suitable lift to match existing pavement edge. The equipment required for this work will include a blade, backhoe, paver, roller, and spreader. Vehicles required include a truck for materials, a labor pick-up truck, and a water truck. The project is approximately 3.3 miles long. The additional truck lane will be approximately 14 feet wide, while the shoulder will be approximately 10 feet wide.

Retaining Walls

A total of three retaining walls will be constructed within the project footprint. Originally, a fourth wall was proposed, but this wall has since been eliminated; the original numbering of the walls has been retained on the project plans. The locations and expected dimensions are listed below.

- Wall #1 (Soil Nail Wall); has been removed during design revisions.
- Wall #2 (Soil Nail Wall); Station 188+80 to 195+80; Maximum Dimensions: 29 feet high, 700 feet long and 1-foot wide.

- Wall #3 (Soil Nail Wall); Station 262+40 to 282+60; Maximum Dimensions: 8 feet high, 1,980 feet long and 1-foot wide.
- Wall #4 (Soil Nail Wall); Station 289+20 to 293+20; Maximum Dimensions: 9 feet high, 360 feet long and 1-foot wide.

Soil Nail Walls

Soil nail walls function as retaining walls. They are essentially used to reinforce excavations or retaining walls to allow steeper cuts and or deeper excavations. Soil can be effectively reinforced by installing closely spaced grouted steel bars, or "soil nail tendons" into a slope or excavation proceeds from the original ground to the bottom or from the top-down. The bars are usually installed into a pre-drilled hole and then grouted into place or drilled and grouted simultaneously.

The construction of the soil nail walls will involve excavating a vertical cut to the elevation of the soil nails, drilling holes for the nails, installing and grouting the soil nails, placing the geocomposite drain strips, the initial shotcrete layer, and install the bearing plates and nut, and placing the final facing (for permanent walls), in this case shotcrete layer.

The equipment required for this work will include excavators, lateral drill rigs (excavator mounted or other rig), forklift or crane (to lift steel tendons), a grouting mixer, and pumper. The slurry that is produced by the use of water during drilling will be fully contained and disposed of at an approved facility and will not be allowed to enter any drainage systems or waterways.

Drainage System

A total of 31 culverts cross under I-580. The diameters of the culverts range from 18 to 106 inches. Culverts in the project area primarily enter an underground drainage system. Those culverts on the western side of the Altamont Pass drain to Arroyo Seco then Alameda Creek, while those on the eastern side drain to Mountain House Creek. Repairs to the existing drainage culverts may include replacing or extending inlets and outlets.

Treatment BMPs

Silt fencing or other erosion control measures will be installed to prevent sediment and pollutant discharges to state and federal waters and wetlands. Temporary erosion control measures will be implemented on all disturbed areas. Permanent erosion control measures will be implemented upon completion of construction. All disturbed areas will be revegetated with appropriate native, non-invasive species or non-persistent hybrids that will serve to stabilize site conditions.

Equipment Staging

Five potential staging areas have been identified, including the Greenville Road off-ramp/on-ramp area, the North Flynn Road off-ramp truck brake check area, the median area east of North Flynn Interchange, the median area at the eastern end of the project, station 287+00 to station 292+00, and the pullout area east of the eastern-most project boundary.

Access Roads

Access (haul) roads will not be necessary for shoulder work, due to the project's proximity to I-580. However, temporary access roads may be required along the cut/fill line to facilitate construction. No other access roads are anticipated.

Site Clean-up and Restoration

All construction-related materials including construction fencing will be removed after construction activities are complete. The temporarily disturbed areas and staging areas will be cleaned up, recontoured to original grade, and revegetated with appropriate native species, as necessary. Permanent erosion control, including soil stabilization measures such as hydroseeding and coir netting, will be applied to all temporarily affected project areas to minimize erosion after construction.

Post-Project Maintenance

When the project is completed, maintenance will be performed by Caltrans or by approved contractors hired by Caltrans for those tasks. Standard Caltrans practices for cleaning, repairing, and otherwise maintaining I-580 throughout the length of the project area will be followed.

Construction Schedule

Construction work is currently scheduled to begin in February 2012 and will be completed by spring 2014. There are two main phases to construction: outside construction and widening, and then the inside (median) widening. Night work will be necessary for re-striping after the roadway widening is completed. Restriping would occur twice, at the end of each construction phase. Caltrans anticipates completion of each phase by October of each construction season. The first instance is anticipated for Fall 2012 following the completion of Phase 1 for the widening of the outside lanes and would require fourteen (14) nights of work. This includes 6 nights to restripe the new lanes, followed by 8 nights to restripe the existing lanes. The second instance is anticipated for Fall 2013 following the completion of Phase 2 for the widening of the inside lanes and would require four (4) nights of work. Night work will be minimized to the maximum extent practicable.

Proposed Conservation Measures

Proposed Compensation

To offset permanent effects to California red-legged frog, California tiger salamander and San Joaquin kit fox, suitable habitat for each species, or suitable multi-species habitat in coordination with the Service, will be created, restored, or set aside in perpetuity at a ratio of 3:1 for permanent effects and 1.1:1 for temporary effects (Table 2). Alternatively, credits will be purchased at a Service-approved conservation bank. On-site restoration of temporarily affected areas may qualify as compensation at a 1:1 ratio once conditions are verified by the Service.

Table 2: Proposed Compensation for Temporary and Permanent Effects

Species	Effects						Total Compensation
	Temporary (acres)			Permanent (acres)			
	Impact	Compensation Ratio	Compensation Need	Impact	Compensation Ratio	Compensation Need	
California red-legged frog	15.86	1.1:1	17.45	0.37	3:1	1.11	18.56
California tiger salamander	15.86	1.1:1	17.45	0.37	3:1	1.11	18.56
San Joaquin kit fox	15.86	1.1:1	17.45	0.32	3:1	0.96	18.41

General Conservation Measures

To reduce potential effects to sensitive biological resources, Caltrans proposes to incorporate construction Best Management Practices and avoidance and minimization measures into the proposed roadway construction project. These measures will be communicated to the contractor through the use of special provisions included in the contract bid solicitation package. These measures include the following:

1. **Seasonal Avoidance.** To the extent practicable, construction will not occur during the wet season, when California red-legged frogs and California tiger salamanders are most active. Except for limited vegetation clearing (necessary to minimize nesting birds from constraining project work during the dry season), work will be limited to the period from April 15 to October 15.

2. **Minimize Nighttime Work.** To the extent practicable, nighttime construction will be minimized to avoid effects to nocturnally active listed species.

3. **Onsite Construction Personnel Education Program.** Before the onset of construction activities, a qualified biologist will conduct an education program for all construction personnel. At a minimum the training will include a description of California red-legged frog, California tiger salamander, San Joaquin kit fox, and other listed species and their habitats; the occurrence of these species within the action area; an explanation of the status of these species and protection under the ESA; the measures to be implemented to conserve listed species and their habitats as they relate to the work site; and boundaries within which construction may occur. A fact sheet conveying this information will be prepared and distributed to all construction crews and project personnel entering the project footprint. Upon completion of the program, personnel will sign a form stating that they attended the program and understand all the avoidance and minimization measures and implications of ESA.

4. **Environmentally Sensitive Area Fencing.** Prior to the start of construction, Environmentally Sensitive Areas (ESA), comprising high-visibility orange construction fencing, will be installed along the perimeter of the project footprint where sensitive habitat occurs. The fencing will clearly delineate the areas within the project footprint where construction, access and staging may occur and will prevent the encroachment of construction equipment/personnel into sensitive habitats supporting special-status species. The specific locations of wetlands and waters of the U.S./State within or directly adjacent to the project footprint will be verified by the U.S. Army Corps of Engineers and will be included on construction drawings. The final project plans will depict the locations where and how the ESA fencing will be installed. The bid solicitation package special provisions will provide clear language regarding acceptable fencing material and prohibited construction-related activities, vehicle operation, material and equipment storage, and other surface-disturbing activities within ESA.

5. **Wildlife Exclusion Fencing.** Prior to the start of construction, Wildlife Exclusion Fencing (WEF) for California red-legged frog, California tiger salamander and San Joaquin kit fox will be installed along the project footprint where listed species could enter the project site. The location of the fencing will be determined by the Resident Engineer and Service-approved biologist, and approved by the Service, based on habitat suitability. The final project plans will show where and how the WEF will be installed.

The bid solicitation package special provisions will provide clear language regarding acceptable fencing material and proper WEF installation and maintenance. The fencing will maintained throughout the duration of the work activities, regularly inspected, and completely removed following project completion.

6. **Implementation of BMPs.** Storm Water Pollution Prevention Plans (SWPPP) and erosion control best management practices (BMPs) will be developed and implemented to minimize any wind or water-related erosion (Appendix B of the biological assessment). The SWPPP will provide guidance for design staff to include provisions in construction contracts to include measures to protect sensitive areas and to prevent and minimize storm water'and non-storm water discharges. Protective measures will include, at a minimum:

    a. No discharge of pollutants from vehicle and equipment cleaning is allowed into any storm drains or water courses.

    b. Vehicle and equipment fueling and maintenance operations must be at least 100 ft away from water courses, except at established commercial gas stations or established vehicle maintenance facility.

    c. Concrete wastes are collected in washouts and water from curing operations is collected and disposed of and not allowed into water courses.

    d. Spill containment kits will be maintained onsite at all times during construction operations and/or staging or fueling of equipment.

    e. Dust control will be implemented, including use of water trucks and tackifiers to control dust in excavation and fill areas, covering temporary access road entrances and exits with rock (rocking), and covering temporary stockpiles when weather conditions require.

    f. Coir rolls or straw wattles will be installed along or at the base of slopes during construction to capture sediment.

    g. Protection of graded areas from erosion using a combination of silt fences, fiber rolls along toes of slopes or along edges of designated staging areas, and erosion control netting (such as jute or coir) as appropriate on sloped areas.

    h. Permanent erosion control measures such as bio-filtration strips and swales to receive storm water discharges from the highway, or other impervious surfaces will be incorporated to the maximum extent practicable.

7. **Construction Site Restrictions.** The following site restrictions will be implemented to avoid adversely affecting sensitive habitats and harm or harassment to listed species:

    a. A speed limit of 15 miles per hour (mph) in the action area in unpaved areas will be enforced to reduce dust and excessive soil disturbance.

    b. Construction access, staging, storage, and parking areas, will be located within the project ROW outside of any designated ESA or outside of the ROW in areas

environmentally cleared by the contractor. Access routes and the number and size of staging and work areas will be limited to the minimum necessary to construct the proposed project. Routes and boundaries of roadwork will be clearly marked prior to initiating construction or grading.

c. Any borrow material will be certified to be non-toxic and weed free.

d. All food and food-related trash items will be enclosed in sealed trash containers and removed completely from the site at the end of each day.

e. No pets from project personnel will be allowed anywhere in the action area during construction.

f. No firearms will be allowed on the project site except for those carried by authorized security personnel, or local, State or Federal law enforcement officials.

g. All equipment will be maintained such that there will be no leaks of automotive fluids such as gasoline, oils or solvents and a Spill Response Plan will be prepared. Hazardous materials such as fuels, oils, solvents, etc. will be stored in sealable containers in a designated location that is at least 100 ft from wetlands and aquatic habitats.

h. Servicing of vehicles and construction equipment including fueling, cleaning, and maintenance will occur at least 100 ft from any aquatic habitat unless separated by topographic or drainage barrier or unless it is an already existing gas station. Staging areas may occur closer to the project activities as required.

8. **Avoidance of Entrapment**. To prevent inadvertent entrapment of animals during construction, all excavated, steep-walled holes or trenches more than 2 ft deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled they must be thoroughly inspected for trapped animals. All replacement pipes, culverts, or similar structures stored in the action area overnight will be inspected before they are subsequently moved, capped and/or buried. If at any time a listed species is discovered, the Resident Engineer and Service-approved biologist will be immediately informed. The Service-approved biologist will determine if relocating the species is necessary and will work with the Service and CDFG prior to handling or relocating unless otherwise authorized.

9. **Vegetation Removal**. Any vegetation that is within the cut and fill line or growing in locations where permanent structures will be placed (e.g., shoulder widening) will be cleared. Vegetation will be cleared only when necessary and will be cut above soil level except in areas that will be excavated for roadway construction. This will allow plants that reproduce vegetatively to resprout after construction. All clearing and grubbing of woody vegetation will occur by hand or by light construction equipment between August 15 and October 31, outside of the bird nesting season and prior to the rainy season. If for any reason this schedule cannot be met, surveys for nesting migratory birds will be conducted before clearing begins. All nest avoidance requirements of the Migratory Bird Treaty Act (MBTA) and California Department of Fish and Game (CDFG) Code will be observed. All cleared vegetation will be removed from the ROW to prevent attracting

small animals to the project site. The contractor will be responsible for obtaining all permits, licenses and environmental clearances for properly disposing of materials. A Service-approved biologist will be present during all grubbing and vegetation clearing activities. If at any point California red-legged frogs, California tiger salamanders, San Joaquin kit fox, or other listed species are discovered during these activities, the Service-approved biologist through the Resident Engineer or their designee, will halt all work within 50 feet of the animal and contact the Service to determine how to proceed.

10. **Reduce Spread of Invasive Species**. To reduce the spread of invasive non-native plant species and minimize the potential decrease of palatable vegetation for wildlife species, Caltrans will comply with Executive Order 13112. This order is provided to prevent the introduction of invasive species and provide for their control in order to minimize the economic, ecological, and human health impacts. In the event that high- or medium-priority noxious weeds are disturbed or removed during construction or construction-related activities, the contractor will contain the plant material associated with these noxious weeds and dispose of it in a manner that will not promote the spread of the species. The contractor will be responsible for obtaining all permits, licenses and environmental clearances for properly disposing of materials. Areas subject to noxious weed removal or disturbance will be replanted with fast-growing native grasses or a native erosion control seed mixture. If seeding is not possible, the area should be covered to the extent practicable with heavy black plastic solarization material until the end of the project.

11. **Revegetation**. All slopes or unpaved areas affected by the proposed project will be re-seeded with native grasses and shrubs to stabilize the slopes and bare ground against erosion. Following construction, native (and non-native if appropriate) plant species will be installed at the disturbed area(s).

California Red-Legged Frog and California Tiger Salamander Protective Measures

12. **Proper Use of Erosion Control Devices**. To prevent California red-legged frogs and California tiger salamanders from becoming entangled or trapped in erosion control materials, plastic mono-filament netting (erosion control matting) or similar material will not be used within the action area. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.

13. **Preconstruction Surveys**. Preconstruction surveys will be conducted by a Service-approved biologist immediately prior to the initiation of any ground disturbing activities within or adjacent to suitable California red-legged frog or California tiger salamander habitat. These surveys will comprise walking transects while conducting visual encounter surveys within areas that will be subject to vegetation clearing, grubbing, grading, cut and fill, or other ground disturbing activities. All fossorial mammal burrows will be inspected for signs of frog or salamander usage to the maximum extent practicable. If it is determined that a burrow may be occupied by a California red-legged frog and/or California tiger salamander, the burrow will be excavated by hand, if possible, and the individual(s) relocated in accordance with the observation and handling protocol outlined below.

14. **Biological Monitoring.** A Service-approved biologist will be present onsite to monitor for California red-legged frogs and California tiger salamanders. Through

communication with the Resident Engineer or their designee, the biologist may stop work if deemed necessary for any reason to protect listed species and will advise to the Resident Engineer or designee on how to proceed accordingly. The biologist will be present during all construction activities within or adjacent to suitable frog and salamander habitat. The biologist will conduct clearance surveys at the beginning of each day and regularly throughout the workday when construction is occurring within or adjacent to suitable frog and salamander habitat.

15. **Protocol for Species Observation and Handling**. If California red-legged frogs or California tiger salamanders are encountered in the action area, work within 50 feet of the animal will cease immediately and the Resident Engineer and Service-approved biologist will be notified. Based on the professional judgment of the Service-approved biologist, if project activities can be conducted without harming or injuring the animal(s), it may be left at the location of discovery and monitored by the Service-approved biologist. All project personnel will be notified of the finding and at no time shall work occur within 50 feet of the animal without a biological monitor present. If it is determined by the Service-approved biologist that relocating the California red-legged frog(s) or California tiger salamander(s) is necessary, the following steps will be followed:

    a. Prior to handling and relocation the Service-approved biologist will take precautions to prevent introduction of amphibian diseases in accordance with the *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* (Service 2005) and *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (Service 2003). Disinfecting equipment and clothing is especially important when biologists are coming to the action area to handle amphibians after working in other aquatic habitats.

    b. California red-legged frogs and California tiger salamanders will be captured by hand, dipnet or other Service-approved methodology, transported by hand, dipnet or temporary holding container, and released as soon as practicable the same day of capture. Handling of California red-legged frogs and California tiger salamanders will be minimized to the maximum extent practicable. Holding/transporting containers and dipnets will be thoroughly cleaned and disinfected prior to transporting to the action area and will be rinsed with freshwater onsite immediately prior to usage unless doing so would result in the injury or death of an individual frog or salamander due to the time delay.

    c. California red-legged frogs and California tiger salamanders will be relocated to the nearest suitable habitat outside of the area where actions would result in harm or harassment and released on the same side of I-580 where it was discovered. If salamanders are captured from burrows, they will be relocated to the nearest active burrow network outside of the work zone. The release burrow(s) will be actively occupied by ground squirrels, since inactive burrows can collapse if not maintained. No more than two juvenile or adult salamanders will be released into the same burrow. Transporting California red-legged frogs and California tiger salamanders to a location other than the location described herein will require written authorization of the Service.

San Joaquin Kit Fox Protective Measures

16. **Protocol for Species Observation and Reporting.** If a San Joaquin kit fox, kit fox den, or any animal that construction personnel believe may be an kit fox, is encountered during project construction, or if any contractor, employee, or agency personnel inadvertently performs an action that results in take of kit fox, the following protocol shall be observed:

    a. All work that could result in direct injury, disturbance, or harassment of the individual animal or den will cease immediately within 1,500 feet of the observation/den. The Resident Engineer and on-site biological monitor will be immediately notified.

    b. If a kit fox is observed, the individual(s) will be allowed to leave the site voluntarily and will be monitored by the on-site biologist.

    c. If a kit fox den is observed, the type and status of the den will be determined in accordance with the *San Joaquin Kit Fox Survey Protocol for the Northern Range* (Service 1999). All active San Joaquin kit fox dens will be protected to the maximum extent practicable.

    d. The Service-approved Biologist will notify the Service and CDFG of the observation within 24 hours.

17. **Capping/Inspection of Culvert/Pipes.** Because San Joaquin kit fox are attracted to den-like structures, such as culverts and pipes, and may enter stored culverts or pipes and become trapped, all culverts, pipes, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be either securely capped prior to storage or thoroughly inspected by the Service-approved biologist for kit fox before the pipe is buried, capped, or otherwise used or moved in any way. Any kit fox found in a pipe or culvert shall be allowed to escape unimpeded.

Large-Flowered Fiddleneck

18. **Focused Plant Surveys.** Caltrans will conduct one focused rare plant preconstruction survey for the large-flowered fiddleneck. The survey timing will generally occur from April to May but will be adjusted based on regional conditions during the survey year. The surveys will be conducted in areas of ground disturbance within the action area and will be coordinated with the Service to determine the appropriate survey period. If possible, the surveyors will view a known reference population prior to the survey event to confirm the species identification and blooming status of the species. In the event that large-flowered fiddleneck is detected within the action area, Caltrans will reinitiate consultation with the Service to assess the effects to the species and determine the appropriate avoidance, minimization, and mitigation measures.

Analytical Framework for Jeopardy

Jeopardy Determinations

In accordance with policy and regulation, the jeopardy analysis in this Biological Opinion relies on four components: (1) the *Status of the Species* and (2) *Environmental Baseline*, which evaluates the California red-legged frog, California tiger salamander, and San Joaquin kit fox range-wide conditions, the factors responsible for that condition, and their survival and recovery needs; and evaluates the condition of these species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of these four animals; (3) the *Effects of the Action*, which determines the direct and indirect effects of the proposed Federal action and the effects of any interrelated or interdependent activities on these species; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on them.

In accordance with policy and regulation, this jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the California red-legged frog, California tiger salamander, and San Joaquin kit fox 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 any of these species in the wild.

The jeopardy analysis in this Biological Opinion places an emphasis on consideration of the range-wide survival and recovery of the California red-legged frog, California tiger salamander, and San Joaquin kit fox and the role of the action area in the survival and recovery of these listed species 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 proposed action, the Service considers the action area to comprise a 3.8-mile segment of I-580 from west of the Greenville Road undercrossing (PM 8.2) eastward to PM 4.9, approximately one-mile east of North Flynn Road in Alameda County, California. The action area encompasses the project footprint, equipment staging areas, access routes, Caltrans Right-of-Way (ROW) limits, project-specific construction easements, and adjacent lands that will be subjected to noise, light, ground vibration, construction vehicle traffic/parking, and human presence/activity that exceed current nominal levels.

Status of the Species and Environmental Baseline

California Red-legged Frog

Listing Status: The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813). Critical Habitat was designated for this species on April 13, 2006 (71 FR 19244) and a proposed revision was published on September 16, 2008 (73 FR 53492). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002).

Description: The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 2003), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Distribution: The historic range of the red-legged frog extended coastally from the vicinity of Elk Creek in Mendocino County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico (Fellers 2005; Jennings and Hayes 1985; Hayes and Krempels 1986). The red-legged frog was historically documented in 46 counties but the taxa now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (Service 2002). Red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast. Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (CDFG 2009).

Status and Natural History: California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and manmade ponds, and ephemeral drainages in valley bottoms and foothills up to 4,920 feet in elevation (Jennings and Hayes 1994, Bulger *et al.* 2003, Stebbins 2003). However, red-legged frogs also have been found in ephemeral creeks and drainages and in ponds that may or may not have riparian vegetation. California red-legged frogs breed between November and April in still or slow-moving water at least 2.3 feet in depth with emergent vegetation, such as cattails (*Typha* spp.), tules (*Scirpus* spp.) or overhanging willows (*Salix* spp.) (Hayes and Jennings 1988). Red-legged frogs have paired vocal sacs and vocalize in air (Hayes and Krempels 1986). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto 1984). Red-legged frogs breed from November through March with earlier breeding records occurring in southern localities (Storer 1925). Individuals occurring in coastal drainages are active year-round (Jennings *et al.* 1992), whereas those found in interior sites are normally less active during the cold season.

During other parts of the year, habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer (Fellers 2005). According to Fellers (2005), this can include vegetated areas with coyote brush (*Baccharis pilularis*), California blackberry thickets (*Rubus ursinus*), and root masses associated with willow (*Salix species*) and California bay (*Umbellularis californica*) trees. Sometimes the non-breeding habitat used by red-legged frogs is extremely limited in size. For example, non-breeding red-legged frogs have been found in a 6-foot wide coyote brush thicket growing along a tiny intermittent creek surrounded by heavily grazed grassland (Fellers 2005). Sheltering habitat for red-legged frogs is potentially all aquatic, riparian, and upland areas within the range of the species and includes any landscape features that provide cover, such as existing animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used. Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer

sheltering habitat. Accessibility to sheltering habitat is essential for the survival of red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival.

California red-legged frogs do not have a distinct breeding migration (Fellers 2005). Adult frogs are often associated with permanent bodies of water. Some frogs remain at breeding sites all year while others disperse. Dispersal distances are typically less than 0.5-mile, with a few individuals moving up to 1-2 miles (Fellers 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers 2005).

In a study of California red-legged frog terrestrial activity in a mesic area of the Santa Cruz Mountains, Bulger *et al.* (2003) categorized terrestrial use as migratory and non-migratory. The latter occurred from one to several days and was associated with precipitation events. Migratory movements were characterized as the movement between aquatic sites and were most often associated with breeding activities. Bulger reported that non-migrating frogs typically stayed within 200 feet of aquatic habitat 90% of the time and were most often associated with dense vegetative cover, i.e. California blackberry, poison oak and coyote brush. Dispersing frogs in northern Santa Cruz County traveled distances from 0.25-mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger *et al.* 2003).

In a study of California red-legged frog terrestrial activity in a xeric environment, Tatarian (2008) noted that a 57% majority of frogs fitted with radio transmitters in the Round Valley study area in eastern Contra Costa County stayed at their breeding pools, whereas 43% moved into adjacent upland habitat or to other aquatic sites. This study reported a peak of seasonal terrestrial movement occurring in the fall months, with movement commencing with the first 0.2-inch of precipitation. Movements away from the source pools tapered off into spring. Upland movement activities ranged from 3 to 233 feet, averaging 80 feet, and were associated with a variety of refugia including grass thatch, crevices, cow hoof prints, ground squirrel burrows at the bases of trees or rocks, logs, and a downed barn door; others were associated with upland sites lacking refugia (Tatarian 2008). The majority of terrestrial movements lasted from 1 to 4 days; however, one adult female was reported to remain in upland habitat for 50 days (Tatarian 2008). Uplands closer to aquatic sites were used more often and frog refugia were more commonly associated with areas exhibiting higher object cover, e.g. woody debris, rocks, and vegetative cover. Subterranean cover was not significantly different between occupied upland habitat and non-occupied upland habitat.

California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Egg masses containing 2,000 to 5,000 eggs are attached to vegetation below the surface and hatch after 6 to 14 days (Storer 1925, Jennings and Hayes 1994). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings *et al.* 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand results in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3½ to 7 months following hatching and reach sexual maturity 2 to 3 years of age (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1985, 1990, 1994). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings *et al.* 1992). Sexual maturity normally is reached at 3 to 4 years of age (Storer 1925; Jennings and Hayes 1985). Red-legged frogs may live 8 to 10 years (Jennings *et al.* 1992). Populations of red-legged

frogs fluctuate from year to year. When conditions are favorable red-legged frogs can experience extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, red-legged frogs may temporarily disappear from an area when conditions are stressful (e.g., drought).

The diet of California red-legged frogs is highly variable and changes with the life history stage. The diet of larval California red-legged frogs is not well studied, but is likely similar to that of other ranid frogs, feeding on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Kupferberg 1996a, 1996b, 1997; Fellers 2005). Hayes and Tennant (1985) analyzed the diets of California red-legged frogs from Cañada de la Gaviota in Santa Barbara County during the winter of 1981 and found invertebrates (comprising 42 taxa) to be the most common prey item consumed; however, they speculated that this was opportunistic and varied based on prey availability. They ascertained that larger frogs consumed larger prey and were recorded to have preyed on Pacific tree frogs, three-spined stickleback (*Gasterosteus aculeatus*) and to a limited extent, California mice (*Peromyscus californicus*), which were abundant at the study site (Hayes and Tennant 1985, Fellers 2005). Although larger vertebrate prey was consumed less frequently, it represented over half of the prey mass eaten by larger frogs suggesting that such prey may play an energetically important role in their diets (Hayes and Tennant 1985). Juvenile and subadult/adult frogs varied in their feeding activity periods; juveniles fed for longer periods throughout the day and night, while subadult/adults fed nocturnally (Hayes and Tennant 1985). Juveniles were significantly less successful at capturing prey and all life history stages exhibited poor prey discrimination; feeding on several inanimate objects that moved through their field of view (Hayes and Tennant 1985).

Metapopulation and Patch Dynamics: The direction and type of habitat used by dispersing animals is especially important in fragmented environments (Forys and Humphrey 1996). Models of habitat patch geometry predict that individual animals will exit patches at more "permeable" areas (Buechner 1987; Stamps *et al.* 1987). A landscape corridor may increase the patch-edge permeability by extending patch habitat (La Polla and Barrett 1993), and allow individuals to move from one patch to another. The geometric and habitat features that constitute a "corridor" must be determined from the perspective of the animal (Forys and Humphrey 1996).

Because their habitats have been fragmented, many endangered and threatened species exist as metapopulations (Verboom and Apeldom 1990; Verboom *et al.* 1991). A metapopulation is a collection of spatially discrete subpopulations that are connected by the dispersal movements of the individuals (Levins 1970; Hanski 1991). For metapopulations of listed species, a prerequisite to recovery is determining if unoccupied habitat patches are vacant due to the attributes of the habitat patch (food, cover, and patch area) or due to patch context (distance of the patch to other patches and distance of the patch to other features). Subpopulations on patches with higher quality food and cover are more likely to persist because they can support more individuals. Large populations have less of a chance of extinction due to stochastic events (Gilpin and Soule 1986). Similarly, small patches will support fewer individuals, increasing the rate of extinction. Patches that are near occupied patches are more likely to be recolonized when local extinction occurs and may benefit from emigration of individuals via the "rescue" effect (Hanski 1982; Fahrig and Merriam 1985; Gotelli 1991; Holt 1993). For the metapopulation to persist, the rate of patches being colonized must exceed the rate of patches going extinct (Levins 1970). If some subpopulations go extinct regardless of patch context, recovery actions should be placed on patch attributes. Patches could be managed to increase the availability of food and/or cover. Movements and dispersal corridors likely are critical to California red-legged frog population dynamics, particularly because the animals likely currently persist as metapopulations with

disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Petit *et al.* 1995; Buza *et al.* 2000; Hilty and Merenlender 2004).

Most metapopulation or meta-population-like models of patchy populations do not directly include the effects of dispersal mortality on population dynamics (Hanski 1994; With and Crist 1995; Lindenmayer and Possingham 1996). Based on these models, it has become a widely held notion that more vagile species have a higher tolerance to habitat loss and fragmentation than less vagile species. But models that include dispersal mortality predict exactly the opposite: more vagile species should be more vulnerable to habitat loss and fragmentation because they are more susceptible to dispersal mortality (Fahrig 1998; Casagrandi and Gatto 1999). This prediction is supported by Gibbs (1998), who examined the presence-absence of five amphibian species across a gradient of habitat loss. He found that species with low dispersal rates are better able than more vagile species to persist in landscapes with low habitat cover. Gibbs (1998) postulated that the land between habitats serves as a demographic "drain" for many amphibians. Furthermore, Bonnet *et al.* (1999) found that snake species that use frequent long-distance movements have higher mortality rates than do sedentary species.

Threats: Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the red-legged frog throughout its range. Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish (*Procambarus clarkii*), signal crayfish (*Pacifastacus leniusculus*), and several species of warm water fish including sunfish (*Lepomis* spp.), goldfish (*Carassius auratus*), common carp (*Cyprinus carpio*), and mosquitofish (*Gambusia affinis*) (Moyle 1976, S. Barry 1992, L. Hunt 1993, Fisher and Schaffer 1996). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs (*Rana aurora aurora*), and suggested that bullfrogs could prey on subadult northern red-legged frogs as well. Bullfrogs may also have a competitive advantage over red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan 1984). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Further more, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Bullfrogs also interfere with red-legged frog reproduction. Both California and northern red-legged frogs have been observed in amplexus (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; M. Jennings 1993). Thus bullfrogs are able to prey upon and out-compete red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to red-legged frog habitat has also impacted red-legged frogs. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks red-legged frog dispersal, and the introduction of predatory fishes and bullfrogs. This report further identifies the conversion and isolation of perennial pool habitats resulting from urbanization as an ongoing impact to red-legged frogs. Mao *et al.* (1999 cited in Fellers 2005) reported northern red-legged frogs infected with an

iridovirus, which was also presented in sympatric threespine sticklebacks (*Gasterosteus aculeatus*) in northwestern California. Ingles (1932a, 1932b, and 1933) reported four species of trematodes from red-legged frogs, but he later synonymized two of them (found them to be the same as the other two).

Diseases may also pose a significant threat though the specific effects of disease on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson *et al.* 2003). Chytridiomycosis and ranaviruses are a potential threat to the red-legged frog because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson *et al.* 2003; Lips *et al.* 2003). Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner *et al.* 2006). Human activities can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (i.e. contaminated boots or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in the listed species being more susceptible to the effects of disease. Disease will likely become a growing threat because of the relatively small and fragmented remaining California red-legged frog breeding sites, the many stresses on these sites due to habitat losses and alterations, and the many other potential disease-enhancing anthropogenic changes that have occurred both inside and outside the species' range.

Negative effects to wildlife populations from roads and pavement may extend some distance from the actual road, as the proposed project. The phenomenon can result from any of the effects already described in this biological opinion, such as vehicle-related mortality, habitat degradation, and invasive exotic species. Forman and Deblinger (1998) described the area affected as the "road effect" zone. Along a 4-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1970 feet. However, in places they detected an effect greater than 0.6-mile from the road. The "road-zone" effect can also be subtle. Van der Zande *et al.* (1980) reported that lapwings (*Vanellus vanellus*) and black-tailed godwits (*Limosa limosa*) feeding at 1,575 – 6,560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep (*Ovis canadensis*) increases near roads (MacArthur *et al.* 1979). Trombulak and Frossell (2000) described another type of "road-zone' effect due to contaminants. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, by elevated levels of metals in both soil and plants were detected at 660 feet of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman (2000) estimated the effect zone along primary roads of 1,000 feet in woodlands, 1,197 feet in grasslands, and 2,657 feet in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road zone" effect with regard to California red-legged frogs has not been adequately investigated.

The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the California red-legged frog are especially vulnerable to roads and well-used large paved areas in the landscape. Van Gelder (1973) and Cooke (1995) have examined the effect of roads on amphibians and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species. The annual average daily traffic volume for Interstate 580 from Greenville Road to the Interstate 580/680 interchange ranged from 109,000 to 134,000 vehicles per day in 1997 and increased significantly from 142,000 to 196,000 in 2003. The average daily traffic volumes are projected to increase by 43% by 2025 (Caltrans 2008). Large,

high-volume highways pose a nearly impenetrable barrier to amphibians and result in mortality to individual animals as well as significantly fragmenting habitat. Hels and Buchwald (2001) found that mortality rates for anurans on high traffic roads are higher than on low traffic roads. Vos and Chardon (1998) found a significant negative effect of road density on the occupation probability of ponds by the moor frog (*Rana arvalis*) in the Netherlands. In addition, incidences of very large numbers of road-killed frogs are well documented (e.g., Asley and Robinson 1996), and studies have shown strong population level effects of traffic density (Carr and Fahrig 2001) and high traffic roads on these amphibians (Van Gelder 1973; Vos and Chardon 1998). Most studies regularly count road kills from slow moving vehicles (Hansen 1982; Rosen and Lowe 1994; Drews 1995; Mallick *et al.* 1998) or by foot (Munguira and Thomas 1992). These studies assume that every victim is observed, which may be true for large conspicuous mammals, but it certainly is not true for small animals, such as the California red-legged frog. Amphibians appear especially vulnerable to traffic mortality because they readily attempt to cross roads, are slow-moving and small, and thus can not easily be avoided by drivers (Carr and Fahrig 2001).

Status of the Species: The recovery plan for California red-legged frogs identifies eight Recovery Units (Service 2002). The establishment of these Recovery Units is based on the Recovery Team's determination that various regional areas of the species' range are essential to its survival and recovery. The status of the red-legged frog will be considered within the smaller scale of Recovery Units as opposed to the overall range. These Recovery Units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of the range of the California red-legged frog. The goal of the Recovery Plan is to protect the long-term viability of all extant populations within each Recovery Unit. Within each Recovery Unit, core areas have been delineated and represent contiguous areas of moderate to high red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations that, combined with suitable dispersal habitat, will allow for the long term viability within existing populations. This management strategy will allow for the recolonization of habitat within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of red-legged frogs.

Environmental Baseline

The action area is located within the East San Francisco Bay Core Area (Alameda Creek Hydrologic Sub-Area) and the Diablo Range and Salinas Valley Recovery Unit (Service 2002, 2006). The recovery action guidelines provide recommendations for minimizing the effects of various land and water uses, non-native species/predators, and air and water contamination in addition to outlining recommendations for habitat preservation. These recommendations assist in the conservation and recovery of the species, protect high quality habitat within core areas and priority watersheds, increase opportunities for dispersal, population expansion and recolonization, and provide connectivity between core areas and occupied watersheds. The conservation needs for the East San Francisco Bay Core Area are: (1) protect existing populations; (2) control non-native predators; (3) study effects of grazing in riparian corridors, ponds and uplands, e.g. on East Bay Regional Park District lands; (4) reduce impacts associated with livestock grazing; (5) protect habitat connectivity; (6) minimize effects of recreation and off-road vehicle use, e.g. Corral Hollow watershed; (7) avoid and reduce impacts of urbanization; and (8) protect habitat buffers from nearby urbanization.

The project is located within the known range of the California red-legged frog. The grazed California annual grasslands, coyotebrush/California annual grassland, California

buckwheat/California annual grassland, coast sagebrush/California annual grassland and coyotebrush scrub vegetation communities within the action area are part of a larger mosaic of essential habitat features sustaining a viable core population – sheltering, foraging and dispersal – within the Livermore and Altamont foothills. Based on the biological assessment provided by Caltrans and the site visit conducted by the Service, no known or potential breeding habitat is present within the action area; however, a total of 43 ponds, stock ponds, reservoirs, and other water bodies are present within a one-mile radius of the BSA. The entire action area is within dispersal distance of known and potential breeding sites and all vegetation communities within the action area are considered suitable upland habitat. No focused frog or roadkill surveys were conducted in preparation of the biological assessment; however, California Native Diversity Database (CNDDB) records reported 162 occurrences within a 10-mile radius of the project footprint.

Interstate 580 poses a significant barrier to the safe north-south movement and dispersal of California red-legged frogs in the portion of core habitat within the action area. A vegetated median between the eastbound and westbound lanes extends up to 100 feet in some areas and provides similar, but highly disturbed, ruderal upland and dispersal habitat. Two existing culverts provide potential passage for red-legged frogs under the eastbound lane into the central median. Based on the quality and accessibility of habitat within the action area, the Service expects undeveloped habitats south of I-580 to be inhabited with greater occupancy and in greater abundance than habitat within the vegetated median habitat based primarily on its comparative accessibility to frogs.

Upland and dispersal habitat within the action area are important to the conservation and recovery of the species based on the following: 1) they are located within the known range of the species and within the East San Francisco Bay Core Area; 2) they provide suitable habitat for juvenile and adult life history stages of the species; 3) they provide connectivity with occupied watersheds to the south, east and west; and 4) they provide opportunities for dispersal, population expansion and recolonization. For these reasons, the Service has determined there is a reasonable potential for juvenile and adult California red-legged frogs to inhabit, forage, seek refuge or disperse within and through the action area.

California Tiger Salamander

Listing Status: The final rule listing the Central California tiger salamander distinct population segment as a threatened species was published on August 4, 2004 (69 FR 47212). Critical habitat was designated on August 23, 2005 in 19 counties for the Central population (70 FR 49380).

Description: The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Recorded adult measurements have been as much as 8.2 inches long (Petranka 1998; Stebbins 2003). Tiger salamanders exhibit sexual dimorphism (differences in body appearance based on gender) with males tending to be larger than females. Tiger salamander coloration generally consists of random white or yellowish markings against a black body. The markings on adults California tiger salamanders tend to be more concentrated on the lateral sides of the body, whereas other tiger salamander species tend to have brighter yellow spotting that is heaviest on the dorsal surface.

Distribution: The California tiger salamander is endemic to California and historically inhabited the low-elevation grassland and oak savanna plant communities of the Central Valley, adjacent foothills, and Inner Coast Ranges (Jennings and Hayes 1994; Storer 1925; Shaffer *et al.*

1993). The species has been recorded from near sea level to approximately 3,900 feet in the Coast Ranges and to approximately 1,600 feet 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. Three distinct California tiger salamander populations are recognized and correspond to Santa Maria area within Santa Barbara County, the Santa Rosa Plain in Sonoma County, and vernal pool/grassland habitats throughout the Central Valley.

Status and Natural History: The tiger salamander has an obligate biphasic life cycle (Shaffer *et al.* 2004). Although the larvae develop in the vernal pools and ponds in which they were born, tiger salamanders are otherwise terrestrial and spend most of their post-metamorphic lives in widely dispersed underground retreats (Shaffer *et al.* 2004; Trenham *et al.* 2001). Because they spend most of their lives underground, tiger salamanders are rarely encountered even in areas where salamanders are abundant. Subadult and adult tiger salamanders typically spend the dry summer and fall months in the burrows of small mammals, such as California ground squirrels and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Although ground squirrels have been known to eat tiger salamanders, the relationship with their burrowing hosts is primarily commensal (an association that benefits one member while the other is not affected) (Loredo *et al.* 1996; Semonsen 1998).

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 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 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 depend on persistent small mammal activity to create, maintain, and sustain sufficient underground refugia for the species. Burrows are short lived without continued small mammal activity and typically collapse within approximately 18 months (Loredo *et al.* 1996).

Upland burrows inhabited by tiger salamanders have often been referred to as aestivation sites. However, "aestivation" implies a state of inactivity, while most evidence suggests that tiger salamanders remain active in their underground dwellings. A recent study has found that tiger salamanders move, feed, and remain active in their burrows (Van Hattem 2004). Because tiger salamanders arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving, researchers have long inferred that 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 tiger salamanders.

Tiger salamanders typically emerge from their underground refugia at night during the fall or winter rainy season (November-May) to migrate to their breeding ponds (Stebbins 1989, 2003; Shaffer *et al.* 1993; Trenham *et al.* 2000). The breeding period is closely associated with the rainfall patterns in any given year with less adults migrating and breeding in drought years (Loredo and Van Vuren 1996; Trenham *et al.* 2000). Male salamander are typically first to arrive and generally remain in the ponds longer than females. Results from a 7-year study in Monterey County suggested that males remained in the breeding ponds for an average of 44.7 days while females remained for an average of only 11.8 days (Trenham *et al.* 2000). Historically, breeding

ponds were likely limited to vernal pools, but now include livestock stock ponds. Ideal breeding ponds are typically fishless, and seasonal or semi-permanent (Barry and Shaffer 1994; Petranka 1998).

While in the ponds, adult salamanders mate and then the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Egg laying typically reaches a peak in January (Loredo and Van Vuren 1996; Trenham *et al.* 2000). 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). Eggs are often attached to objects, such as rocks and boards in ponds with no or limited vegetation (Jennings and Hayes 1994). Clutch sizes from a Monterey County study had an averaged of 814 eggs (Trenham *et al.* 2000). Seasonal pools may not exhibit sufficient depth, persistence, or other necessary parameters for adult breeding during times of drought (Barry and Shaffer 1994). After breeding and egg laying is complete, adults leave the pool and return to their upland refugia (Loredo *et al.* 1996; Trenham 1998a). Adult salamanders often continue to emerge nightly for approximately the next two weeks to feed in their upland habitat (Shaffer *et al.* 1993).

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 and mid-July (Loredo and Van Vuren 1996; Trenham *et al.* 2000). The larvae are totally aquatic and range in length from approximately 0.45 to 0.56-inch (Petranka 1998). They have yellowish gray bodies, broad fat heads, large, feathery external gills, and broad dorsal fins that extend well up their back. 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 tadpoles of Pacific treefrogs (*Hyla regilla*), western spadefoot toads (*Spea hammondii*), and California red-legged frogs (J. Anderson 1968; P. Anderson 1968). 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 tiger salamander larval stage is typically completed in 3 to 6 months with most metamorphs entering upland habitat during the summer (Petranka 1998). In order to be successful, the aquatic phase of this species' life history must correspond with the persistence of its seasonal aquatic habitat. Most seasonal ponds and pools dry up completely during the summer. 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).

Larval development and metamorphosis can vary and is often site-dependent. Larvae collected near Stockton in the Central Valley during April varied between 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left breeding pools 60 to 94 days after eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. Longer ponding duration typically results in larger larvae and metamorphosed juveniles that are more likely to survive and reproduce (Semlitsch *et al.* 1988; Morey 1998; Pechmann *et al.* 1989; Trenham 1998b). Larvae will perish if a breeding pond dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1988) found a strong positive correlation between ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 sampled pools supported larval California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only 6 (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).

Following metamorphosis, juveniles leave their pools and enter upland habitat. This emigration can occur in both wet and dry conditions (Loredo and Van Vuren 1996; Loredo *et al.* 1996). Wet conditions are more favorable for upland travel but rare summer rain events seldom occur as metamorphosis is completed and ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under dry conditions, juveniles may be limited to seeking upland refugia in close proximity to their aquatic larval pool. These individuals often wait until the next winter's rains to move further into more suitable upland refugia. Although likely rare, larvae may over-summer in permanent ponds. Juveniles remain active in their upland habitat, emerging from underground refugia during rainfall events to disperse or forage (Trenham and Shaffer 2005). Depending on location and other development factors, metamorphs will not return as adults to aquatic breeding habitat for 2 to 5 years (Loredo and Van Vuren 1996; Trenham *et al.* 2000).

Lifetime reproductive success for tiger salamander species is low. Results from one study suggest that the average female tiger salamander bred 1.4 times and produced 8.5 young per reproductive effort that survived to metamorphosis (Trenham *et al.* 2000). This resulted in the output of roughly 11 metamorphic offspring over a breeding female's lifetime. The primary reason for low reproductive success may be that this relatively short-lived species requires two or more years to become sexually mature (Shaffer *et al.* 1993). Some individuals may not breed until they are four to six years old. While California tiger salamanders may survive for more than ten years, many breed only once, and in one study, less than 5 percent of marked juveniles survived to become breeding adults (Trenham 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well human-caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated pools can quickly extirpate a population.

Dispersal and migration movements made by tiger salamanders can be grouped into two main categories: (1) breeding migration; and (2) interpond dispersal. Breeding migration is the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years. At a study in Monterey County, it was found that upon reaching sexual maturity, most individuals returned to their natal/ birth pond to breed, while 20 percent dispersed to other ponds (Trenham *et al.* 2001). After breeding, adult tiger salamanders return to upland habitats, where they may live for one or more years before attempting to breed again (Trenham *et al.* 2000).

Tiger salamanders are known to travel large distances between breeding ponds and their upland refugia. Generally it is difficult to establish the maximum distances traveled by any species, but tiger salamanders in Santa Barbara County have been recorded dispersing up to 1.3 miles from their breeding ponds (Sweet 1998). Tiger salamanders are also known to travel between breeding ponds. One study found that 20 to 25 percent of the individuals captured at one pond were recaptured later at other ponds approximately 1,900 and 2,200 feet away (Trenham *et al.* 2001). In addition to traveling long distances during juvenile dispersal and adult migration, tiger salamanders may reside in burrows far from their associated breeding ponds.

Although previously cited information indicates that tiger salamanders can travel long distances, they typically remain close to their associated breeding ponds. A trapping study conducted in Solano County during the winter of 2002/2003 suggested that juveniles dispersed and used upland habitats further from breeding ponds than adults (Trenham and Shaffer 2005). More juvenile salamanders were captured at traps placed at 328, 656, and 1,312 feet from a breeding pond than at 164 feet. Approximately 20 percent of the captured juveniles were found at least 1,312 feet from the nearest breeding pond. The associated distribution curve suggested that 95 percent of juvenile salamanders were within 2,099 feet of the pond, with the remaining 5 percent being found at even greater distances. Preliminary results from the 2003-04 trapping efforts at the same study site detected juvenile tiger salamanders at even further distances, with a large proportion of the captures at 2,297 feet from the breeding pond (Trenham *et al.*, unpublished data). Surprisingly, most juveniles captured, even those at 2,100 feet, were still moving away from ponds (Ben Fitzpatrick, University of California at Davis, personal communication, 2004). In Santa Barbara County, juvenile California tiger salamanders have been trapped approximately 1,200 feet away while dispersing from their natal pond (Science Applications International Corporation, unpublished data). These data show that many California tiger salamanders travel far while still in the juvenile stage. Post-breeding movements away from breeding ponds by adults appear to be much smaller. During post-breeding emigration from aquatic habitat, radio-equipped adult tiger salamanders were tracked to burrows between 62 to 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult California tiger salamanders exiting the ponds with depleted physical reserves, or drier weather conditions typically associated with the post-breeding upland migration period.

California tiger salamanders are also known to use several successive burrows at increasing distances from an associated breeding pond. Although previously sited studies provide information regarding linear movement from breeding ponds, upland habitat features appear to have some influence on movement. Trenham (2001) found that radio-tracked adults were more abundant in grasslands with scattered large oaks (*Quercus* spp.), than in more densely wooded areas. Based on radio-tracked adults, there is no indication that certain habitat types are favored as terrestrial movement corridors (Trenham 2001). In addition, captures of arriving adults and dispersing new metamorphs were evenly distributed around two ponds completely encircled by drift fences and pitfall traps. Thus, it appears that dispersal into the terrestrial habitat occurs randomly with respect to direction and habitat types.

Threats: Documented or potential tiger salamanders predators include coyotes (*Canis latrans*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), egrets (*Egretta species*), great blue herons (*Ardea herodias*), crows (*Corvus brachyrhynchos*), ravens (*Corvus corax*), garter snakes (*Thamnophis species*), bullfrogs, California red-legged frogs, mosquito fish, and crayfish (*Procrambus* spp.). Domestic dogs have been observed eating California tiger salamanders at Lake Lagunitas at Stanford University (Sean Barry, ENTRIX, personal communication to C. Nagano, July 2004).

The California tiger salamander is imperiled throughout its range due to a variety of human activities (Service 2004). Current factors associated with declining tiger salamander populations include continued habitat loss and degradation due to agriculture and urbanization; hybridization with the non-native eastern tiger salamander (*Ambystoma tigrinum*) (Fitzpatrick and Shaffer 2004; Riley *et al.* 2003); and predation by introduced species. 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 and jeopardized the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal, and are capable of colonizing or "rescuing" extinct habitat patches). Other threats include disease, predation, interspecific competition, urbanization and population growth, exposure to contaminants, rodent and mosquito control, road-crossing mortality, and hybridization with non-native salamanders. Currently, these various primary and secondary threats are largely not being offset by existing federal, state, or local regulatory mechanisms. The tiger salamander is also prone to chance environmental or demographic events, to which small populations are particularly vulnerable.

The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the California tiger salamander are especially vulnerable to roads and well-used large paved areas in the landscape. Van Gelder (1973) and Cooke (1995) have examined the effect of roads on amphibians and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species. The annual average daily traffic volume for Interstate 580 from Greenville Road to Grant Line Road ranged from 117,000 to 142,000 vehicles per day in 1997 as reported by the Caltrans Traffic Operations Program, Traffic and Vehicle Data Systems (All About Roads Interstate Guide 2002). The average daily traffic volumes are projected to increase by 43% by 2025 (Caltrans 2008). Large, high-volume highways pose a nearly impenetrable barrier to amphibians and result in mortality to individual animals as well as significantly fragmenting habitat. Hels and Buchwald (2001) found that mortality rates for anurans on high traffic roads are higher than on low traffic roads (Hels and Buchwald 2001). Vos and Chardon (1998) found a significant negative effect of road density on the occupation probability of ponds by the moor frog (*Rana arvalis*) in the Netherlands. In addition, incidences of very large numbers of road-killed frogs are well documented (e.g., Asley and Robinson 1996), and studies have shown strong population level effects of traffic density (Carr and Fahrig 2001) and high traffic roads on these amphibians (Van Gelder 1973; Vos and Chardon 1998). Most studies regularly count road kills from slow moving vehicles (Hansen 1982; Rosen and Lowe 1994; Drews 1995; Mallick *et al.* 1998) or by foot (Munguira and Thomas 1992). These studies assume that every victim is observed, which may be true for large conspicuous mammals, but it certainly is not true for small animals, such as the California red-legged frog. Amphibians appear especially vulnerable to traffic mortality because they readily attempt to cross roads, are slow-moving and small, and thus can not easily be avoided by drivers (Carr and Fahrig 2001).

The direction and type of habitat used by dispersing animals is especially important in fragmented environments (Forys and Humphrey 1996). Models of habitat patch geometry predict that individual animals will exit patches at more "permeable" areas (Buechner 1987; Stamps *et al.* 1987). A landscape corridor may increase the patch-edge permeability by extending patch habitat (La Polla and Barrett 1993), and allow individuals to move from one patch to another. The geometric and habitat features that constitute a "corridor" must be determined from the perspective of the animal (Forys and Humphrey 1996).

Because their habitats have been fragmented, many endangered and threatened species exist as metapopulations (Verboom and Apeldom 1990; Verboom *et al.* 1991). A metapopulation is a collection of spatially discrete subpopulations that are connected by the dispersal movements of the individuals (Levins 1970; Hanski 1991). For metapopulations of listed species, a prerequisite to recovery is determining if unoccupied habitat patches are vacant due to the attributes of the habitat patch (food, cover, and patch area) or due to patch context (distance of the patch to other patches and distance of the patch to other features). Subpopulations on patches with higher quality food and cover are more likely to persist because they can support more individuals.

Large populations have less of a chance of extinction due to stochastic events (Gilpin and Soule 1986). Similarly, small patches will support fewer individuals, increasing the rate of extinction. Patches that are near occupied patches are more likely to be recolonized when local extinction occurs and may benefit from emigration of individuals via the "rescue" effect (Hanski 1982; Gotelli 1991; Holt 1993; Fahrig and Merriam 1985). For the metapopulation to persist, the rate of patches being colonized must exceed the rate of patches going extinct (Levins 1970). If some subpopulations go extinct regardless of patch context, recovery actions should be placed on patch attributes. Patches could be managed to increase the availability of food and/or cover. Movements and dispersal corridors likely are critical to California tiger salamander population dynamics, particularly because the animals likely currently persist as metapopulations with disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Petit *et al.* 1995; Buza *et al.* 2000; Hilty and Merenlender 2004).

Most metapopulation or meta-population-like models of patchy populations do not directly include the effects of dispersal mortality on population dynamics (Hanski 1994; With and Crist 1995; Lindenmayer and Possingham 1996). Based on these models, it has become a widely held notion that more vagile species have a higher tolerance to habitat loss and fragmentation than less vagile species. But models that include dispersal mortality predict exactly the opposite: more vagile species should be more vulnerable to habitat loss and fragmentation because they are more susceptible to dispersal mortality (Fahrig 1998; Casagrandi and Gatto 1999). This prediction is supported by Gibbs (1998), who examined the presence-absence of five amphibian species across a gradient of habitat loss. He found that species with low dispersal rates are better able than more vagile species to persist in landscapes with low habitat cover. Gibbs (1998) postulated that the land between habitats serves as a demographic "drain" for many amphibians. Furthermore, Bonnet *et al.* (1999) found that snake species that use frequent long-distance movements have higher mortality rates than do sedentary species.

Negative effects to wildlife populations from roads and pavement may extend some distance from the actual road, as the proposed project. The phenomenon can result from any of the effects already described in this biological opinion, such as vehicle-related mortality, habitat degradation, and invasive exotic species. Forman and Deblinger (1998) described the area affected as the "road effect" zone. Along a 4-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1970 feet. However, in places they detected an effect > 0.6 mile from the road. Rudolph *et al.* (1999) detected reduced snake abundance up to 2,790 feet from roads in Texas. They estimated snake abundance out to 2,790 feet, so the effect may have been greater. Extrapolating to a landscape scale, they concluded the effect of roads on snake populations in Texas likely was significant, given that approximately 79% of the land area of the Lone Star State is within 1,640 feet of a road. The "road-zone" effects can be subtle. Van der Zandt *et al.* (1980) reported that lapwings (*Vanellus vanellus*) and black-tailed godwits (*Limosa limosa*) feeding at 1,575 feet-6,560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep (*Ovis canadensis*)

increases near roads (MacArthur *et al.* 1979). Trombulak and Frossell (2000) described another type of "road-zone' effect. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, by elevated levels of metals in both soil and plants were detected at 660 feet of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman (2000) estimated the effect zone along primary roads of 1,000 feet in woodlands, 1,197 feet in grasslands, and 2,657 feet in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road zone" and the California tiger salamander have not been adequately investigated.

Status of the Species: Thirty-one percent (221 of 711 records and occurrences) of all California tiger salamander records and occurrences are located in Alameda, Santa Clara, San Benito (excluding the extreme western end of the County), southwestern San Joaquin, western Stanislaus, western Merced, and southeastern San Mateo counties. Of these counties, most of the records are from eastern Alameda and Santa Clara counties (Buckingham in litt. 2003; Service 2004; CDFG 2009). The California Department of Fish and Game (2009) now considers 13 of these records from the Bay Area region as extirpated or likely to be extirpated.

Of the 140 reported California tiger salamander localities where wetland habitat was identified, only 7 percent were located in vernal pools (CDFG 2009). 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 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 2009). This places the 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 California tiger salamander. California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins 1989; East Bay Regional Park District 2003). Proposed land conversion continues to target large areas of California tiger salamander habitat. One such project in Alameda County totals 700 acres (East Bay Regional Parks District 2003). Other proposed projects located within the California tiger salamander's distribution include another 310-acre project in Alameda County, two in San Joaquin County totaling 12,427 acres, and a 19-acre project in Santa Clara County. California tiger salamanders are under increasing pressure from habitat conversion and urbanization, development (i.e. Dublin Ranch, Fallon Village, Fallon Sports Park, Staples Ranch, Shea Center Livermore, and Livermore Toyota), 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 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). 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 2009).

Environmental Baseline

The project is located within the known range of the Central California tiger salamander population. Suitable upland and dispersal habitat are present in the action area within the grazed California annual grasslands, coyotebrush/California annual grassland, California buckwheat/California annual grassland, and coast sagebrush/California annual grassland vegetation communities. Based on the biological assessment, no known or potential breeding habitat is present within the action area; however, one small perennial wetland area, 0.05-acre, characterized as a cattail series, freshwater marsh is present within the action area. This wetland does not exhibit the topography to pond water in sufficient depth or duration required for breeding. Based on the biological assessment provided by Caltrans, a total of 62 ponds, stock ponds, reservoirs, and other water bodies are present within 1.24 miles of the BSA, i.e. the maximum recorded dispersal distance for California tiger salamanders. The entire action area is within dispersal distance of known and potential breeding sites and all annual grassland vegetation communities within the action area provide suitable upland and dispersal habitat.

No focused salamander or roadkill surveys were conducted in preparation of the biological assessment; however, California Native Diversity Database (CNDDB) records reported 182 occurrences (67 located south of I-580) within a 10-mile radius of the project footprint. Four occurrences have been reported immediately adjacent to the action area comprising: 1) an unknown number observed in a vernal pool in 1993 near the intersection of Laughlin Road and North Front Road, approximately 250 feet north of I-580; 2) larvae (CAS #197610) were collected in a vernal pool along the Union Pacific railroad tracks in 1994, approximately 0.4-mile south of I-580; 3) an unknown number of subadults collected (CAS #187406, 187410, and 187411) in 1987 along North Flynn Road, approximately 0.4-mile south of I-580; and 4) 1,000s of larvae were observed in a stock pond in 1993, approximately 0.75-mile east of North Flynn Road and 0.4-mile south of I-580.

The center median exhibits similar habitat characteristics to lands south of I-580, the center median is subject to a higher degree of disturbance since it is entirely bordered by the interstate, and is littered with human refuse. The median is also fairly isolated from lands north and south of the interstate; only two culverts provide potential safe passage under the eastbound lane into the median. Otherwise I-580 poses a significant barrier to the north/south movement and dispersal of salamanders. For these reasons, habitat within the median is considered less suitable and of lower quality than lands south of I-580.

Grassland habitat south of I-580 exhibits the characteristics of upland and dispersal habitat, and is largely undeveloped except for lands near Greenville Road and North Flynn Road. The majority of this land is actively grazed and is leased to wind turbine power generating companies. Fossorial mammal activity is scattered throughout this portion of the action area and provides subterranean habitat that may support salamander aestivation, refugia and foraging. Movement among land tracts south of I-580 is relatively unrestricted. The Service anticipates undeveloped

habitats south of I-580 to be inhabited with greater occupancy and abundance than habitat within the vegetated median due to the quality and accessibility of habitat within the action area.

Undeveloped grassland habitat within the action area is important to the conservation and recovery of California tiger salamanders based on the following: (1) it is located within the known range of the species; (2) it provides suitable upland and dispersal habitat for juvenile and adult life history stages of the species; (3) it provides connectivity with occupied lands to the south; and (4) it provides opportunities for dispersal, population expansion and recolonization. For these reasons and the prevalence of salamanders adjacent to the action area, the Service has determined there is a reasonable potential for California tiger salamanders to inhabit, forage, aestivate and disperse through the action area.

San Joaquin Kit Fox

Listing Status: The San Joaquin kit fox was listed as an endangered species on March 11, 1967 (32 FR 4001) and was listed by the State of California as a threatened species on June 27, 1971. Critical Habitat has not been designated for this species. The Recovery Plan for Upland Species of the San Joaquin Valley, California includes this species (Service 1998).

Status and Natural History: In the San Joaquin Valley before 1930, the range of the San Joaquin kit fox extended from southern Kern County north to Tracy in San Joaquin County, on the west side, and near La Grange in Stanislaus County, on the east side (Grinnell *et al.* 1937; Service 1998). Historically, this species occurred in several San Joaquin Valley native plant communities. In the southernmost portion of the range, these communities included Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland. San Joaquin kit foxes also exhibit a capacity to utilize habitats that have been altered by man. This fox species is present in many oil fields, grazed pasturelands, and "wind farms" (Cypher 2000). Kit foxes can inhabit the margins and fallow lands near irrigated row crops, orchards, and vineyards, and may forage occasionally in these agricultural areas (Service 1998). There are a limited number of observations of San Joaquin kit foxes foraging in trees in urban areas (Murdoch *et al.* 2005). The San Joaquin kit fox seems to prefer more gentle terrain and decreases in abundance as terrain ruggedness increases (Grinnell *et al.* 1937; Morrell 1972; Warrick and Cypher 1999).

Adult San Joaquin kit foxes are usually solitary during late summer and fall. In September and October, adult females begin to excavate and enlarge natal dens (Morrell 1972), and adult males join the females in October or November (Morrell 1972). Typically, pups are born between February and late March following a gestation period of 49 to 55 days (Egoscue 1962; Morrell 1972; Spiegel and Tom 1996; Service 1998). Mean litter sizes reported for San Joaquin kit foxes include 2.0 pups on the Carrizo Plain (White and Ralls 1993), 3.0 at Camp Roberts (Spencer *et al.* 1992), 3.7 in the Lokern area (Spiegel and Tom 1996), and 3.8 at the Naval Petroleum Reserve (Cypher *et al.* 2000). Pups appear above ground at the age of about 3-4 weeks, and are weaned at the age of 6-8 weeks. Adult San Joaquin kit fox reproductive rates (the proportion of females bearing young) vary annually with environmental conditions, particularly food availability. Annual rates range from 0-100 percent, and reported mean rates include 61 percent at the Naval Petroleum Reserve (Cypher *et al.* 2000), 64 percent in the Lokern area (Spiegel and Tom 1996), and 32 percent at Camp Roberts (Spencer *et al.* 1992). Although some yearling female kit foxes will produce young, most do not reproduce until they have reached 2 years-of-age (Spencer *et al.* 1992; Spiegel and Tom 1996; Cypher *et al.* 2000). Some young of both sexes, but particularly females, may delay dispersal and may assist their parents in raising the following

year's litter of pups (Spiegel and Tom 1996). The young kit foxes begin to forage for themselves at about 4-5 months of age (Koopman *et al.* 2000; Morell 1972).

Although most young kit foxes disperse less than 5 miles from their natal home ranges (Scrivner *et al.* 1987), dispersal distances of up to 76.3 miles have been documented for the San Joaquin kit fox (Scrivner *et al.* 1987; Service 1998). Dispersal can be through disturbed habitats, including agricultural fields, and across highways and aqueducts. The age at dispersal ranges from 4-32 months (Cypher 2000). Among juvenile kit foxes surviving to July 1 at the Naval Petroleum Reserve, 49 percent of the males dispersed while 24 percent of the females dispersed from natal home ranges (Koopman *et al.* 2000). Among dispersing kit foxes, 87 percent did so during their first year of age. Most, 65.2 percent, of the dispersing juveniles at the Naval Petroleum Reserve died within 10 days of leaving their natal home den (Koopman *et al.* 2000). Some kit foxes delay dispersal and may inherit their natal home range.

San Joaquin kit foxes are reputed to be poor diggers, and their dens are usually located in areas with loose-textured, friable soils (Morrell 1972; O'Farrell 1983). However, the depth and complexity of their dens suggest that they possess good digging abilities, and kit fox dens have been observed on a variety of soil types (Service 1998). Some studies have suggested that where hardpan layers predominate, kit foxes create their dens by enlarging the burrows of California ground squirrels (*Spermophilus beecheyi*) or American badgers (*Taxidea taxus*) (Jensen 1972; Morrell 1972; Orloff *et al.* 1986). In parts of their range, particularly in the foothills, kit foxes often use ground squirrel burrows for dens (Orloff *et al.* 1986). Kit fox dens are commonly located on flat terrain or on the lower slopes of hills. About 77 percent of all kit fox dens are at or below mid-slope (O'Farrell 1983), with the average slope at den sites ranging from 0 to 22 degrees (CDFG 1980; O'Farrell 1983; Orloff *et al.* 1986). Natal and pupping dens are generally found in flatter terrain. Common locations for dens include washes, drainages, and roadside berms. Kit foxes also commonly den in human-made structures such as culverts and pipes (O'Farrell 1983; Spiegel *et al.* 1996).

Natal and pupping dens of the San Joaquin kit fox may include from 2 to 18 entrances and are usually larger than dens that are not used for reproduction (O'Farrell *et al.* 1980; O'Farrell and McCue 1981). Natal dens may be reused in subsequent years (Egoscue 1962). It has been speculated that natal dens are located in the same location as ancestral breeding sites (O'Farrell 1983). Active natal dens are generally 1.2 to 2 miles from the dens of other mated kit fox pairs (Egoscue 1962; O'Farrell and Gilbertson 1979). Natal and pupping dens usually can be identified by the presence of scat, prey remains, matted vegetation, and mounds of excavated soil (i.e. ramps) outside the dens (O'Farrell 1983). However, some active dens in areas outside the valley floor often do not show evidence of use (Orloff *et al.* 1986). During telemetry studies of kit foxes in the northern portion of their range, 70 percent of the dens that were known to be active showed no sign of use (e.g., tracks, scats, ramps, or prey remains) (Orloff *et al.* 1986). In another more recent study in the Coast Range, 79 percent of active kit fox dens lacked evidence of recent use other than signs of recent excavation (Jones and Stokes Associates 1997).

A San Joaquin kit fox can use more than 100 dens throughout its home range, although on average, an animal will use approximately 12 dens a year for shelter and escape cover (Cypher *et al.* 2001). Kit foxes typically use individual dens for only brief periods, often for only one day before moving to another den (Ralls *et al.* 1990). Possible reasons for changing dens include infestation by ectoparasites (parasites that live on but not within their hosts), local depletion of prey, or avoidance of coyotes (*Canis latrans*). Kit foxes tend to use dens that are located in the same general area, and clusters of dens can be surrounded by hundreds of hectares of similar

habitat devoid of other dens (Egoscue 1962). In the southern San Joaquin Valley, kit foxes were found to use up to 39 dens within a denning range of 320 to 482 acres (Morrell 1972). An average den density of one den per 69 to 92 acres was reported by O'Farrell (1983) in the southern San Joaquin Valley.

Dens are used by San Joaquin kit foxes for temperature regulation, shelter from adverse environmental conditions, and escape from predators. Kit foxes excavate their own dens, use those constructed by other animals, and use human-made structures (culverts, abandoned pipelines, and banks in sumps or roadbeds). Kit foxes often change dens and may use many dens throughout the year; however, evidence that a den is being used by kit foxes may be absent. San Joaquin kit foxes have multiple dens within their home range and individual animals have been reported to use up to 70 different dens (Hall 1983). At the Naval Petroleum Reserve, individual kit foxes used an average of 11.8 dens per year (Koopman *et al.* 1998). Den switching by the San Joaquin kit fox may be a function of predator avoidance, local food availability, or external parasite infestations (e.g., fleas) in dens (Egoscue 1956).

The diet of the San Joaquin kit fox varies geographically, seasonally, and annually, based on temporal and spatial variation in abundance of potential prey. Known prey species of the kit fox include white-footed mice (*Peromyscus* spp.), insects, California ground squirrels, kangaroo rats (*Dipodomys* spp.), San Joaquin antelope squirrels (*Ammospermophilus nelsoni*), black-tailed hares (*Lepus californicus*), and chukar (*Alectoris chukar*) (Jensen 1972; Archon 1992). Kit foxes also prey on desert cottontails (*Sylvilagus audubonii*), ground-nesting birds, and pocket mice (*Perognathus* spp.).

The diets and habitats selected by coyotes and San Joaquin kit foxes living in the same areas are often quite similar. Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts, which are quite common in semi-arid, Central California. Competition for resources between coyotes and kit foxes may result in kit fox mortalities. Coyote-related injuries accounted for 50-87 percent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserve (Cypher and Scrivner 1992; Standley *et al.* 1992).

San Joaquin kit foxes are primarily nocturnal, although individuals are occasionally observed resting or playing (mostly pups) near their dens during the day (Grinnell *et al.* 1937). Kit foxes occupy home ranges that vary in size from 1.7 to 4.5 square miles (White and Ralls 1993). A mated pair of kit foxes and their current litter of pups usually occupy each home range (White and Ralls 1993, Spiegel 1996; White and Garrott 1997). Other adults, usually offspring from previous litters, also may be present (Koopman *et al.* 2000), but individuals often move independently within their home range (Cypher 2000). Ralls *et al.* (2001) found that foxes sometimes share dens with foxes from other groups; many of these cases involved unpaired individuals and appeared to be unsuccessful attempts at pair formation. Average distances traveled each night range from 5.8 to 9.1 miles and are greatest during the breeding season (Cypher 2000).

Kit foxes maintain core home range areas that are exclusive to mated pairs and their offspring. This territorial spacing behavior eventually limits the number of foxes that can inhabit an area owing to shortages of available space and per capita prey. Hence, as habitat is fragmented or destroyed, the carrying capacity of an area is reduced and a larger proportion of the population is forced to disperse. Increased dispersal generally leads to lower survival rates and, in turn,

decreased abundance because greater than 65 percent of dispersing juvenile foxes dies within 10 days of leaving their natal range (Koopman *et al.* 2000).

Estimates of fox density vary greatly throughout its range, and have been reported as high as 3.11 per square mile in optimal habitats in good years (Service 1998). At the Elk Hills in Kern County, density estimates varied from 1.86 animals per square mile in the early 1980s to 0.03 animals per square mile in 1991 (Service 1998). Kit fox home ranges vary in size from approximately 1 to 12 square miles (Spiegel *et al.* 1996; Service 1998). Knapp (1978) estimated that a home range in agricultural areas is approximately one-square mile. Individual home ranges overlap considerably, at least outside the core activity areas (Morrell 1972; Spiegel *et al.* 1996).

Mean annual survival rates reported for adult San Joaquin kit foxes include 0.44 at the Naval Petroleum Reserve (Cypher *et al.* 2000), 0.53 at Camp Roberts (Standley *et al.* 1992), 0.56 at the Lokern area (Spiegel and Disney 1996), and 0.60 on the Carrizo Plain (Ralls and White 1995). However, survival rates widely vary among years (Spiegel and Disney 1996; Cypher *et al.* 2000). Mean survival rates for juvenile San Joaquin kit foxes (<1 year old) are lower than rates for adults. Survival to 1 year-of-age was 0.14 at the Naval Petroleum Reserve (Cypher *et al.* 2000), 0.20 at Camp Roberts (Standley *et al.* 1992), and 0.21 on the Carrizo Plain (Ralls and White 1995). For both adults and juveniles, survival rates of males and females are similar. San Joaquin kit foxes may live 10 years in captivity (McGrew 1979) and 8 years in the wild (Berry *et al.* 1987), but most kit foxes do not live past 2-3 years of age.

The status (i.e., distribution, abundance) of the kit fox has decreased since its listing in 1967. This trend is reasonably certain to continue into the foreseeable future unless measures to protect, sustain, and restore suitable habitats, and alleviate other threats to their survival and recovery, are implemented. Threats that are seriously affecting kit foxes are described in further detail in the following sections.

Loss of Habitat: Less than 20 percent of the habitat within the historical range of the kit fox remained when the animal was listed as federally-endangered in 1967, and there has been a substantial net loss of habitat since that time. Historically, San Joaquin kit foxes occurred throughout California's Central Valley and adjacent foothills. Extensive land conversions in the Central Valley began as early as the mid-1800s with the Arkansas Reclamation Act. By the 1930's, the range of the kit fox had been reduced to the southern and western parts of the San Joaquin Valley (Grinnell *et al.* 1937). The primary factor contributing to this restricted distribution was the conversion of native habitat to irrigated cropland, industrial uses (e.g., hydrocarbon extraction), and urbanization (Laughrin 1970; Jensen 1972; Morrell 1972, 1975). Approximately one-half of the natural communities in the San Joaquin Valley were tilled or developed by 1958 (Service 1980). Approximately 1.97 million acres of habitat, or about 66,000 acres per year, were converted in the San Joaquin region between 1950 and 1980 (Cowardin *et al.* 1988). The counties specifically noted as having the highest wild land conversion rates included Kern, Tulare, Kings and Fresno, all of which are occupied by the kit fox. From 1959 to 1969 alone, an estimated 34 percent of natural lands were lost within the then-known kit fox range (Laughrin 1970).

By 1979, only approximately 370,000 acres out of a total of approximately 8.5 million acres on the San Joaquin Valley floor remained as non-developed land (Williams 1985). Data from the California Department of Fish and Game and Service file information indicate that between 1977 and 1988, essential habitat for the blunt-nosed leopard lizard (*Gambelia silus*), a species that occupies habitat that is also suitable for kit foxes, declined by about 80 percent – from 311,680

acres to 63,060 acres, an average of about 22,000 acres per year (Biological Opinion for the Interim Water Contract Renewal, Service file 1-1-00-F-0056, February 29, 2000). Virtually all of the documented loss of essential habitat was the result of conversion to irrigated agriculture.

During 1990 to 1996, a gross total of approximately 71,500 acres of habitat were converted to farmland in 30 counties (total area 23.1 million acres) within the Conservation Program Focus area of the Central Valley Project. This figure includes 42,520 acres of grazing land and 28,854 acres of "other" land, which is predominantly comprised of native habitat. During this same time period, approximately 101,700 acres were converted to urban land use within the Conservation Program Focus area (California Department of Conservation 1994, 1996, 1998). This figure includes 49,705 acres of farmland, 20,476 acres of grazing land, and 31,366 acres of "other" land, which is predominantly comprised of native habitat. Because these assessments included a substantial portion of the Central Valley and adjacent foothills, they provide the best scientific and commercial information currently available regarding the patterns and trends of land conversion within the kit fox's geographic range. More than 1 million acres of suitable habitat for kit foxes have been converted to agricultural, municipal, or industrial uses since the listing of the kit fox. In contrast, less than 500,000 acres have been preserved or are subject to community-level conservation efforts designed, at least in part, to further the conservation of the kit fox (Service 1998).

Land conversions contribute to declines in kit fox abundance through direct and indirect mortalities, displacement, reduction of prey populations and denning sites, changes in the distribution and abundance of larger canids that compete with kit foxes for resources, and reductions in carrying capacity. Kit foxes may be buried in their dens during land conversion activities (C. Van Horn, Endangered Species Recovery Program, Bakersfield, personal communication to S. Jones, U.S. Fish and Wildlife Service, Sacramento, California, 2000), or permanently displaced from areas where structures are erected or the land is intensively irrigated (Jensen 1972; Morrell 1975). Furthermore, even moderate fragmentation or loss of habitat may significantly impact the abundance and distribution of kit foxes. Capture rates of kit foxes at the Naval Petroleum Reserve in Elk Hills were negatively associated with the extent of oil-field development after 1987 (Warrick and Cypher 1999). Likewise, the California Energy Commission found that the relative abundance of kit foxes was lower in oil-developed habitat than in nearby undeveloped habitat on the Lokern (Spiegel 1996). Researchers from both studies inferred that the most significant effect of oil development was the lowered carrying capacity for populations of both foxes and their prey species owing to the changes in habitat characteristics or the loss and fragmentation of habitat (Spiegel 1996; Warrick and Cypher 1999).

Dens are essential for the survival and reproduction of kit foxes that use them year-round for shelter and escape and in the spring for rearing young. Hence, kit foxes generally have dozens of dens scattered throughout their territories. However, land conversion reduces the number of typical earthen dens available to kit foxes. For example, the average density of typical, earthen kit fox dens at the Naval Hills Petroleum Reserve was negatively correlated with the intensity of petroleum development (Zoellick *et al.* 1987), and almost 20 percent of the dens in developed areas were found to be in well casings, culverts, abandoned pipelines, oil well cellars, or in the banks of sumps or roads (Service 1983). These results are important because the California Energy Commission found that, even though kit foxes frequently used pipes and culverts as dens in oil-developed areas of western Kern County, only earthen dens were used to birth and wean pups (Spiegel 1996). Similarly, kit foxes in Bakersfield use atypical dens, but have only been found to rear pups in earthen dens (Patrick Kelly, Endangered Species Recovery Program, Fresno, California, pers. Comm. with P. White, U.S. Fish and Wildlife Service, Sacramento,

California, April 6, 2000). Hence, the fragmentation of habitat and destruction of earthen dens could adversely affect the reproductive success of kit foxes. Furthermore, the destruction of earthen dens may also affect kit fox survival by reducing the number and distribution of escape refuges from predators.

Land conversions and associated human activities can lead to widespread changes in the availability and composition of mammalian prey for kit foxes. For example, oil field disturbances in western Kern County have resulted in shifts in the small mammal community from the primarily granivorous species that are the staple prey of kit foxes (Spiegel 1996), to species adapted to early successional stages and disturbed areas (e.g., California ground squirrels) (Spiegel 1996). Because more than 70 percent of the diets of kit foxes usually consist of abundant rabbits (*Lepus* and *Sylvilagus* spp.) and rodents (e.g., *Dipodomys* spp.), and kit foxes often continue to feed on their staple prey during ephemeral periods of prey scarcity, such changes in the availability and selection of foraging sites by kit foxes could influence their reproductive rates, which are strongly influenced by food supply and decrease during periods of prey scarcity (White and Garrott 1997, 1999).

Extensive habitat destruction and fragmentation have contributed to smaller, more-isolated populations of kit foxes. Small populations have a higher probability of extinction than larger populations because their low abundance renders them susceptible to stochastic (i.e., random) events such as high variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988; Frankham and Ralls 1998; Saccheri *et al.* 1998). Similarly, isolated populations are more susceptible to extirpation (localized extinction) by accidental or natural catastrophes because their recolonization has been hampered. These chance events can adversely affect small, isolated populations with devastating results. Extirpation can even occur when the members of a small population are healthy, because whether the population increases or decreases in size is less dependent on the age-specific probabilities of survival and reproduction than on raw chance (sampling probabilities). Owing to the probabilistic nature of extinction, many small populations will eventually lose out and go extinct when faced with these stochastic risks (Caughley and Gunn 1995).

Oil fields in the southern half of the San Joaquin Valley also continue to be an area of expansion and development activity. This expansion is reasonably certain to increase in the near future owing to market-driven increases in the price of oil. The cumulative and long-term effects of oil extraction activities on kit fox populations are not fully known, but recent studies indicate that moderate- to high-density oil fields may contribute to a decrease in carrying capacity for kit foxes owing to habitat loss or changes in habitat characteristics (Spiegel 1996; Warrick and Cypher 1999). There are no limiting factors or regulations that are likely to retard the development of additional oil fields. Hence, it is reasonably certain that development will continue to destroy and fragment kit fox habitat into the foreseeable future.

Road Effects: San Joaquin kit fox mortality and injury may occur when the animals attempt to cross roads and are hit by cars, trucks, or motorcycles. The majority of strikes likely occur at night when the animals are most active. Driver visibility also is lower at night increasing the potential for strikes. Such strikes are usually fatal for an animal the size of a kit fox. Thus, vehicle strikes are a direct source of mortality for the San Joaquin kit fox. If vehicle strikes are sufficiently frequent in a given locality, they could result in reduced kit fox abundance. The death of kit foxes during the November-January breeding season could result in reduced reproductive success. Death of females during gestation or prior to pup weaning could result in

the loss of an entire litter of young, and therefore, reduced recruitment of new individuals into the population.

Occurrences of vehicle strikes involving San Joaquin kit foxes have been well documented, and such strikes occur throughout the range of the species. Sources of kit fox mortality were examined during 1980-1995 at the Naval Petroleum Reserves in California in western Kern County (Cypher *et al.* 2000). During this period, 341 adult San Joaquin kit foxes were monitored using radio telemetry, and 225 of these animals were recovered dead. Of these, 20 were struck by vehicles; 9 percent of adult kit mortalities were attributed to vehicles, and 6 percent of all monitored adults were killed by vehicles. During this same period, 184 juvenile (<1 year old) kit foxes were monitored. Of these, 142 were recovered dead and 11 were killed by vehicles; 8 percent of juvenile kit fox mortalities were attributed to vehicles and 6 percent of all monitored juveniles were killed by vehicles. For both adults and juveniles, vehicle strikes accounted for less than 10 percent of all San Joaquin kit fox deaths in most years. However, in some years, vehicles accounted for about 20 percent of deaths. Predators, primarily coyotes and bobcats, were the primary source of mortality at the Naval Petroleum Reserves. In addition, 70 kit foxes, both radio collared and non-collared, were found dead on roads in and around the Naval Petroleum Reserves during 1980-1991 (U.S. Department of Energy 1993). Of these, 34 were hit by vehicles on the approximately 990 miles of roads at the Reserve, and 36 were struck on the approximately 50 miles of State and County roads (e.g., State Route 119, Elk Hills Road), where traffic volume and average vehicle speed were higher. In western Merced County, 28 San Joaquin kit foxes were radio-collared during 1985-1987 (Briden *et al.* 1992). Seventeen were found dead and two (12 percent) of these deaths were attributed to vehicles. In the City of Bakersfield, 113 San Joaquin kit foxes were radio-collared and monitored during 1997-2000 (Cypher 2000). Thirty-five were recovered dead (123 adults and 12 pups); nine adults (39 percent) and six pups (50 percent) were attributed to vehicle strikes. At this urban site, coyotes and bobcats are rare, and vehicles are the primary source of kit fox mortality. However, survival rates are higher than rates among kit foxes in non-urban areas, and vehicles do not appear to be limiting the population size.

Vehicles constitute a consistent source of mortality for the kit fox, based on the frequency with which vehicle strikes occur. However, the precise effect of vehicle strikes on the San Joaquin kit fox has not been adequately investigated. According to Morrell (1970), "The automobile is by far the major cause of reported San Joaquin kit fox deaths - 128 of 152 deaths reported were caused by automobiles." Morrell acknowledged that the numbers were based on non-radio-collared kit foxes and therefore were biased because road-killed foxes are conspicuous and easily observed compared to animals dying from other causes. Predators such as coyotes, bobcats, non-native red foxes, and domestic dogs likely constitute a higher source of mortality than vehicle strikes (Service 1998; Cypher 2000). Vehicle-related mortality has significantly affected other listed or rare species. Vehicles caused 49 percent of the mortality documented among endangered Florida panthers (*Puma councilor coryi*) (Maehr *et al.* 1991). With a remaining population of 20-30 animals, the loss of a single individual to vehicles constitutes a significant population effect. Similarly, at least 15 percent of the remaining 250-300 key deer (*Odocoileus virginianus clavium*) are killed annually by vehicles (Turbak 1999), and this mortality is considered to be a limiting factor for this endangered species (Service 1985). Mortality from vehicles was the primary source of mortality for endangered ocelots (*Felis pardalis*) in Texas (Turbak 1999), and also contributed to the failure of a lynx (*Lynx canadensis*) reintroduction project in New York (Aubrey *et al.* 1999). Rudolph *et al.* (1999) estimated that road-associated mortality may have depressed populations of Louisiana pine snakes (*Pituophis ruthveni*) and

timber rattlesnakes (*Crotalus horridus*) by over 50 percent in eastern Texas, and this mortality may be a primary factor in local extirpations of timber rattlesnakes (Rudolph *et al.* 1999). Mortality from vehicles also is contributing to the reduction in the status of the prairie garter snake (*Thamnophis radix radix*) in Ohio (Dalrymple and Reichenbach 1984), and was a limiting factor in the recovery of the endangered American crocodile (*Crocodylus acutus*) in Florida (Kushland 1988). In Florida, threatened Florida scrub-jays (*Aphelocoma coerulescens*) suffered higher mortality in territories near roads, as well as reduced productivity due to vehicle strikes of both breeding adults and young (Mumme *et al.* 1999).

Noise Effects: Increase in the ambient noise level may significantly affect kit foxes. Although no specific research has been performed on this species, a "safe, short-term level" for humans has been determined to be 75 decibels (dBA) (NIH 1990; Burglund and Lindvall 1995). The mechanisms leading to permanent hearing damage are the same for all mammals (NIH 1990). However, the enlarged pinna and reduced tragi of kit foxes indicate that hearing is more acute than in humans (Jameson and Peeters 2004). Hearing loss in humans has been correlated with cognitive dysfunction (NIH 1990). However, variation in response to intense noise has been found to vary, in humans, by as much as 30 to 50 dBA between individuals (NIH 1990). Similar variation has been found in animals (NIH 1990). In humans, hearing loss was greater in males than females; however, this may be caused by environmental factors (NIH 1990). Also, younger animals have been shown to be more susceptible to noise-induced hearing loss (NIH 1990). The ability to habituate to noise appears to vary widely between species (NPS 1994). Typical construction machinery produces noise in the range of 75 dBA (arc-welder) to 85 dBA (bulldozer) (Burglund and Lindvall 1995). Long-term noise levels of 85 dBA are recognized to cause permanent hearing damage in humans (NIH 1990). Noise levels at 85 dBA have been correlated with hypertension in Rhesus monkeys (*Macaca fasicularis*) (Cornman 2001). Increased reproductive failure in laboratory mice (*Mus musculus*) was found to occur after a level of 82-85 dBA for one week (Cornman 2001). However, measurable loss of hearing was found to occur in chinchillas (*Chinchilla laniger*) at a sustained level of 70 dBA (Peters 1965). Hearing loss from motorcycle traffic has been documented for the kangaroo rat (*Dipodomys* spp.) (Bondello and Brattstrom 1979) and desert kangaroo rats (*Dipodomys deserti*) showed a significant reduction in reaction distance to the sidewinder (*Crotalus cerastes*) after exposure to 95 dBA (Cornman 2001). Other desert mammals appear to sustain the same effects (Bondello and Brattstrom 1979). Aircraft noise has produced accelerated heart-rates in pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), and elk (*Cervus elaphus*) (MacArthur 1976; Workman *et al.* 1992; all in NPS 1994).

Hearing loss is correlated with distance from the source of the noise. At a level of 110 dBA, guinea pigs (*Cavia porcellus*) suffered long-term hearing loss at distances of 75 and 150 feet, temporary loss at a distance of 300 feet, and no measurable loss at 4,500 feet (Gonzales *et al.* 1970). In water, noise is reduced at a rate of 5 dBA for each doubling of the distance to the source (Komanoff & Shaw 2000). For example, noise measuring 20 dBA at 60 feet registers 15 dBA at 120 feet. Harassment from long-term noise may cause kit foxes to eventually vacate areas of suitable habitat. California condors (*Gymnogyps californianus*) have been shown to abandon nesting sites in response to vehicle noise (Shaw 1970). Grizzly bears (*Ursus arctos*), mountain goats (*Oreamnos canadensis*), caribou (*Rangifer* spp.), and bighorn sheep (*Ovis* spp.) have been found to abandon foraging or calving grounds in response to aircraft noise (Chadwick 1973; McCourt *et al.* 1974; Ballard 1975; Krausman and Hervert 1983; Gunn *et al.* 1985; Bleich 1990; all in NPS 1994).

Status of the Species: Habitat in the northern range is highly fragmented by highways, canals, and expanding urbanization. Interstate 580 runs southeast to northwest as it splits from I-5, and turns west through the Altamont Pass area; thereby impeding north-south movement of kit foxes. Although the canal system – California aqueduct and the Delta Mendota Canal – facilitates north-south migration along its length, it also impedes lateral east-west kit fox travel. Existing and future urbanization of Livermore further impedes the movement of kit fox and isolates the northern extent of their range from southern core populations and diminishes the potential for recovery efforts in this region. Between 2000 and 2006, the City of Livermore experienced an 8.2% population increase, growing from 73,345 to 79,438 citizens (U.S. Census Bureau 2006). Comparatively, the County of Alameda experienced a slower but steady rate of increase of 1.4%, which is a fifth of the State growth trend of 7.9% (U.S. Census Bureau 2006).

In the northern portion of their range, habitat loss is the primary cause of the decline of the kit fox. Most of the preferred valley bottom grassland and alkali scrub habitats in the northern range have been eliminated by agricultural, urban and industrial development (Service 1998). Between 2004 and 2006, 111 acres of farmland and 708 acres of grazing land in Alameda County were converted to new development, in part comprising 69 acres in the Altamont quad for residential and park development, 15 acres in each of the Livermore and Dublin quads for new homes, and 80 acres of new apartments in Livermore (California Department of Conservation 2006). This is comparable to the steady decline in the total acreage of farmland and grazing land in Alameda County, which experienced a net decrease of 16,721 acres from 1984 to 2006, and is consistent with the increasing trend of land converted to urban development totaling 18,590 net acres (California Department of Conservation 2006). Proposed land conversion continues to target large areas of San Joaquin kit fox habitat. One such project in Alameda County totals 700 acres (283 hectares) (East Bay Regional Parks District 2003). Other proposed projects located within the San Joaquin kit fox northern range include another 310-acre project in Alameda County, two in San Joaquin County totaling 12,427 acres, and a 19-acre project in Santa Clara County. San Joaquin kit fox are under increasing pressure from habitat conversion and urbanization, development (i.e., Dublin Ranch, Fallon Village, Fallon Sports Park, Staples Ranch, Shea Center Livermore, and Livermore Toyota), 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 kit fox recovery plan identifies several recovery actions to aid the overall population ecology and management. The plan includes: (1) protecting existing suitable habitat on private and public lands to ensure the establishment of viable metapopulations throughout its large geographic range including Contra Costa and Alameda counties; (2) determining habitat restoration and management prescriptions that focus on factors that promote populations of prey species along with determining the direct and indirect effects and economic costs and benefits of rodent and rabbit control programs on kit foxes; (3) and protect existing kit fox habitat in the northern, northeastern, and northwestern segments of their geographic range and existing connections between habitat in those areas and habitat further south.

The primary goal of the recovery strategy for kit foxes identified in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service 1998) is to establish a complex of interconnected core and satellite populations throughout the species' range. The long-term viability of each of these core and satellite populations depends partly upon periodic dispersal and genetic flow between them. Therefore, kit fox movement corridors between these populations must be preserved and maintained. In the northern range, from the Ciervo Panoche region in Fresno County northward, kit fox populations are small and isolated, and have

exhibited significant decline. The core populations are the Ciervo Panoche area, the Carrizo Plain area, and the western Kern County population. Satellite populations are found in the urban Bakersfield area, Porterville/Lake Success area, Creighton Ranch/Pixley Wildlife Refuge, Allensworth Ecological Reserve, Semitropic/Kern National Wildlife Refuge (NWR), Antelope Plain, eastern Kern grasslands, Pleasant Valley, western Madera County, Santa Nella, Kesterson NWR, and Alameda/Contra Costa counties. Major corridors connecting these population areas are on the east and west side of the San Joaquin Valley, including the Millerton Lake area of Fresno County, around the bottom of the Valley, and cross-valley corridors in Kern, Fresno, and Merced counties.

A total of 15 San Joaquin kit fox dens and sightings have been reported within Alameda County and 25 within Contra Costa County between 1973 and 2008 (CDFG 2009). Five of these occurrences have been reported within the last ten years; four in Alameda County (*i.e.*, near Sunol, Brushy Peak, and Bethany Reservoir) and one in Contra Costa County. The latter was reported by Contra Costa Water Department (CCWD) Assistant Watershed Resource Specialist John Howard on September 6, 2008 located near the CCWD office at the Los Vaqueros Reservoir (Mark Mueller pers. comm. 2008). Dispersal of San Joaquin kit fox from the Ciervo-Panoche Natural Area core population in Merced County into the northern portion of the range, a distance of approximately 70 miles, is threatened by land conversion, habitat fragmentation (*i.e.*, Interstates 5, 580 and 205), vehicle strikes, rodenticide usage, predation, and competitive exclusion (Service 1998). Surveys in Contra Costa and Alameda counties have shown that although suitable habitat exists, kit foxes in this area are rare and difficult to detect, as they are in other portions of the current range where sightings are infrequent.

Environmental Baseline

The action area is within the northern range of San Joaquin kit fox and supports habitat suitable for all life history stages including extensive grasslands with connectivity for dispersal and movement to larger, undeveloped land tracts with suitable habitat to the west, south and east. The biological assessment provided by Caltrans identified a total of 101.04 acres of suitable denning and dispersal habitat within the action area. Ground squirrels, California meadow voles (*Microtus californicus*), Botta's pocket gophers, broad-footed moles (*Scapanus latimanus*) and a variety of grassland birds and invertebrates inhabit much of the undeveloped lands within the action area and provide the necessary prey base to support the species. Ground squirrels also provide extensive networks of burrows, which are easily enlarged by kit fox for denning and refugia. The majority of the unpaved area to be affected is along the road verge and exhibits varying levels of disturbance; however, this habitat supports a sustainable prey base and facilitates daily movement and dispersal of kit fox.

No focused kit fox or roadkill surveys were conducted in preparation of the biological assessment; however, California Native Diversity Database (CNDDB) records reported 36 occurrences within a 10-mile radius of the project footprint. The nearest occurrence is located approximately one-mile south of the I-580/North Flynn Road intersection, which comprised a den with two adults and two juveniles in 1989. The majority of this land within the action area south of I-580 is actively grazed in a manner suitable for kit fox occupation and dispersal. Movement among land tracts south of I-580 is relatively unrestricted. However, north/south movement and dispersal by kit fox is expected to be largely restricted by I-580. Based on the biology and ecology of the species, the presence of suitable denning and dispersal habitat within the action area, connectivity to historically occupied habitat to the south, and nearby

observations, the Service has determined that the San Joaquin kit fox is reasonably certain to occur within the action area of this species.

Effects of the Action

California Red-legged Frog and California Tiger Salamander

The proposed project will likely adversely affect the threatened California red-legged frog and threatened California tiger salamander Central population by killing, harming and/or harassing juveniles and adults inhabiting suitable upland and dispersal habitat within the action area. The aspects of the proposed action most likely to affect the California red-legged frog and California tiger salamanders are largely confined to the construction phase of the project and include: 1) inner and outer shoulder reconstruction and lane widening from the Greenville Road undercrossing at PM 8.2 to PM 4.9, approximately one-mile east of North Flynn Road; 2) culvert extension and modifications of existing drainage facilities associated with the shoulder and lane widening; 3) slope repair of slide damage between PM 4.8 and PM 5.6; 4) construction of soil nail walls (retaining walls); and 5) the installation of bioswales and/or detention areas.

The construction of soil nail walls, slide repair and widening of the roadway and shoulders will result in disturbance to large areas of upland habitat. California tiger salamanders, and to a lesser degree California red-legged frogs, spend the majority of their life within burrow networks, primarily those of ground squirrels. Cut and fill earth moving activities will result in the collapse, destruction and removal of burrow networks. Such burrow networks can be extensive; making presence/absence determinations for fossorial animals such as salamanders and frogs difficult. Caltrans proposes to minimize the harm and mortality caused by these activities by performing preconstruction surveys in areas containing suitable upland habitat and having a Service-approved monitor on site during ground disturbing activities.

Construction noise, vibration, and increased human activity may interfere with normal behaviors – feeding, sheltering, movement between refugia and foraging grounds, and other essential behaviors of the California red-legged frog and California tiger salamander – resulting in avoidance of areas that have suitable habitat but intolerable levels of disturbance. Short-term temporal effects will occur when vegetative cover and subterranean upland habitat is removed during project construction. Caltrans proposes to minimize these effects, in part, by locating construction staging, storage and parking areas outside of sensitive habitat; clearly marking construction work boundaries to prevent crews from affecting more habitat than is absolutely necessary, and revegetating all unpaved areas disturbed by project activities.

The proposed construction activities could result in the introduction of chemical contaminants to the site. Frogs and salamanders using these areas could be exposed to any contaminants that are present at the site. Exposure pathways could include inhalation, dermal contact, direct ingestion, or secondary ingestion of contaminated soil, plants or prey species. Exposure to contaminants could cause short- or long-term morbidity, possibly resulting in reduced productivity or mortality. Caltrans proposes to minimize these risks by implementing a Storm Water Pollution Prevention Plan (SWPPP), erosion control Best Management Practices (BMP) and a Spill Response Plan, which will consist of refueling, oiling or cleaning of vehicles and equipment a minimum of 100 ft from aquatic resources; installing coir rolls, straw wattles and/or silt fencing to capture sediment and prevent runoff or other harmful chemicals from entering the wetland; and locating staging, storage and parking areas away from aquatic habitats.

Preconstruction surveys and the relocation of individual California red-legged frogs and California tiger salamanders by a Service-approved biologist will minimize the likelihood of serious injury or mortality; however, capturing and handling frogs may result in stress and/or minor injury during handling, containment, and transport. Death and injury of individuals could occur at the time of relocation or later in time subsequent to their release. Although survivorship for translocated amphibians has not been estimated, survivorship of translocated wildlife, in general, is low because of intraspecific competition, lack of familiarity with the relocation site with regards to breeding, feeding, and sheltering habitats, risk of contracting disease in foreign environment, and increased risk of predation. Caltrans proposes to minimize these effects by using qualified Service-approved biologists, limiting the duration of handling, and relocating amphibians to suitable nearby habitat.

Biologists and construction workers traveling to the action area from other project sites may transmit diseases by introducing contaminated equipment. The chance of a disease being introduced into a new area is greater today than in the past due to the increasing occurrences of disease throughout amphibian populations in California and the United States. It is possible that chytridiomycosis, caused by chytrid fungus (*Batrachochytrium dendrobatidis*), may exacerbate the effects of other diseases on amphibians or increase the sensitivity of the amphibian to environmental changes (e.g., water pH) that reduce normal immune response capabilities (Bosch *et al.* 2001, Weldon *et al.* 2004). Implementing proper decontamination procedures prior to and following aquatic surveys and handling of frogs and salamanders will minimize the risk of transferring diseases through contaminated equipment or clothing.

Temporary effects comprise areas denuded, manipulated, or otherwise modified from their existing, pre-project conditions, thereby removing one or more essential components of a listed species' habitat as a result of project activities that include, but are not limited to, construction, staging, storage, lay down, vehicle access, parking, etc. Temporary effects must be restored to baseline habitat values or better within one year following initial disturbance. Areas subject to ongoing operations and maintenance are not considered temporary even if they are restored within one year following initial disturbance. Affected areas not fulfilling these criteria are considered permanent. Construction within upland habitat, e.g. shoulder reconstruction and lane widening, extension of culverts, and construction of soil nail walls, would result in the permanent loss and/or degradation of 0.37-acre of California red-legged frog upland habitat and 0.37-acre of California tiger salamander upland and dispersal habitat; and the temporary loss and/or degradation of 15.86 acres of California red-legged frog upland habitat and 15.86 acres of California tiger salamander upland and dispersal habitat. Caltrans has proposed a compensatory habitat conservation measure at a ratio of 3:1 (acres of compensation to acres of habitat loss) for permanent effects and 1.1:1 for temporary effects.

These effects will be further minimized by installing environmentally sensitive area fencing to keep workers from straying into otherwise undisturbed habitat; erecting wildlife exclusion fencing to deter frogs and salamanders from wandering onto the construction site; implementing storm water and erosion BMP's; educating workers about the presence of California red-legged frogs and California tiger salamanders, their habitat, identification, regulatory laws, and avoidance and minimization measures; and requiring a Service-approved biologist(s) to be present to monitor project activities within or adjacent to suitable habitat.

San Joaquin Kit Fox

The proposed project will likely adversely affect the endangered San Joaquin kit fox by harming and harassing juveniles and adults inhabiting and/or dispersing through habitat within the action area. Due to accessibility of habitat south of I-580 and heavy traffic loads along I-580, the effects to San Joaquin kit fox habitat will be largely confined to the grassland habitat south of I-580. The aspects of the proposed action most likely to affect the kit fox are largely confined to the construction phase of the project and include: 1) inner and outer shoulder reconstruction and lane widening from the Greenville Road undercrossing at PM 8.2 to PM 4.9, approximately one-mile east of North Flynn Road; 2) culvert extension and modifications of existing drainage facilities associated with the shoulder and lane widening; 3) slope repair of slide damage between PM 4.8 and PM 5.6; 4) construction of soil nail walls (retaining walls); and 5) the installation of bioswales and/or detention areas.

Disturbance caused by the proposed action resulting from construction noise, vibration, odors, and human activity can interfere with sensory perception of kit fox, decreasing their ability to locate prey, pups, or mates, or detect approaching predators. Disturbance can induce stress which can result in adverse physiological conditions and alter normal behaviors. The resulting effects can lead to increased energetic requirements, decreased reproductive success and immunological functions, altered temporal or spatial use patterns, displacement, and in some cases death. Responses to external stresses vary among individuals, causing some animals to be more affected than others; however, it is unknown whether disturbance results in reduced local abundance. Project effects on the San Joaquin kit fox are expected to be greater during the den selection, gestation, and the early rearing period of the breeding cycle (December through July) than at other times of the year.

Vehicles constitute a consistent, but variable source of mortality for the animal, based on the frequency with which vehicle strikes occur. Vehicle strikes appear to occur most frequently where roads transverse areas where the animals are abundant. However, the linear quantity of roads in a given area may not be directly related to the number of vehicle strikes in a given area. The type of road (e.g., number of lanes) traffic volume, and average speed of vehicles likely all influence the number of San Joaquin kit fox/vehicle strikes. The number of strikes likely increases with road size, traffic volume, and average speed (Clevenger and Waltho 1999). Another factor influencing the number of vehicles striking this endangered mammal, but for which little data is available, is the frequency with which the animals cross roads and are therefore at risk. The proportion of successful road crossings by these animals likely declines with increasing road size, traffic volume and density, and vehicle speeds. The proportion of San Joaquin kit foxes successfully crossing roads may increase in areas where they obtain more experience crossing roads, such as in and near urban areas. The loss of kit fox to vehicles may constitute a significant population effect within their northern range where they occur in low abundance. Morrell (1970) reported vehicle strikes to be the major cause of death for kit foxes based on study in which 128 of 152 deaths were reportedly caused by automobiles. Within eastern Alameda County, EIP Associates (CNDDB Occ. #585) reported a kit fox along Interstate 205 near the Alameda/San Joaquin County line in 1986; Spencer (CNDDB Occ. #41) reported a single adult running along Kelso Road on June 20, 1992; and Beeman (CNDDB Occ. #39) reported a single adult kit fox crossing Patterson Pass Road on June 23, 1995. This evidence suggests that kit fox utilize habitat along rural roads and highways near the action area, increasing their susceptibility to mortality or injury caused by vehicle strikes. These effects will be minimized by enforcing 15 mph speed limits on all unpaved areas within the action area and

locating parking and staging areas in the median, which is subject to a higher degree of disturbance than land south of I-580.

Roads have been documented as barriers to movements by a variety of species, and this effect varies with road size and traffic volume. Bobcats (*Felis rufus*) in Wisconsin readily crossed dirt roads, but were reluctant to cross paved roads (Lovallo and Anderson 1996). Lynx also exhibit a reluctance to cross roads (Barnum 1999) as do mountain lions (*Felis concolor*) (Van Dyke *et al.* 1986). In a study in North Carolina, the number of road crossings by black bears (*Ursus americanus*) was inversely related to traffic volume, and bears almost never crossed an interstate highway (Brody and Pelton 1989). The inhibition of animal movements caused by roads produces a significant effect by fragmenting habitats and populations (Joly and Morand 1997). Knapp (1978) monitored movements of radio-collared San Joaquin kit foxes in the vicinity of Interstate 5 in Kern County. Many of the foxes used areas within 2 miles of the highway, and most exhibited movement and home range patterns that parallel the highway, but did not cross it. Only on 2 occasions were animals located on the opposite side of the highway from their primary area of use. Interstate 580 likely has a similar effect on kit fox in Alameda County. The widening of Interstate 580 will not significantly increase the barrier effect based on the high pre-project traffic loads, which was reported by Caltrans as 2,848 Average Daily Traffic Volume (ADTV) during the morning and 7,577 ADTV during the evening (Caltrans 2009). Caltrans anticipates the traffic load to increase by 43% by 2025. Two existing culverts will remain in place and will be extended, which will continue to facilitate safe passage under the eastbound lane of I-580 in as much as they may currently be used.

The Proposed Conservation Measures outlined in the biological assessment will minimize adverse effects to the San Joaquin kit fox by requiring a qualified Service-approved biologist to be present to monitor project activities within or adjacent to areas designated as suitable kit fox habitat; educating workers about the presence of San Joaquin kit fox, their habitat, identification, regulatory laws, and avoidance measures; erecting deterrent fencing to minimize the likelihood of kit foxes entering the construction area; installing construction fencing to keep construction workers from straying outside of the project footprint and disturbing additional habitat and/or species; covering all steep-walled holes or trenches more than 2 feet deep at the end of each workday; disposing of all food-related trash items in closed containers and removing from the action area daily; inspecting all den-like structures such as pipes or culverts prior to being buried, capped or moved; restricting the presence of firearms within the action area to law enforcement personnel; prohibiting bringing domestic animals to the action area; minimizing erosion and the spread of invasive species; outlining emergency actions and preventative measures for spills, refueling, fires, and other deleterious activities; and restoring habitat disturbed during construction to pre-project conditions or better.

Temporary effects comprise areas denuded, manipulated, or otherwise modified from their existing, pre-project conditions, thereby removing one or more essential components of a listed species' habitat as a result of project activities that include, but are not limited to, construction, staging, storage, lay down, vehicle access, parking, etc. Temporary effects must be restored to baseline habitat values or better within one year following initial disturbance. Areas subject to ongoing operations and maintenance are not considered temporary even if they are restored within one year following initial disturbance. Affected areas not fulfilling these criteria are considered permanent. Construction within upland habitat, e.g. shoulder reconstruction and lane widening, extension of culverts, and construction of soil nail walls, will result in the permanent loss and/or degradation of 0.32-acre and the temporary loss and/or degradation of 15.86 acres of San Joaquin kit fox denning and dispersal habitat. Caltrans has proposed a compensatory habitat

conservation measure at a ratio of 3:1 (acres of compensation to acres of habitat loss) for permanent effects and 1.1:1 for temporary effects.

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. No other State, Tribal, local or private actions are anticipated in the action area within the foreseeable future.

The global average temperature has risen by approximately 0.6 degrees centigrade during the 20th Century (International Panel on Climate Change 2001, 2007; Adger *et al* 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (International Panel on Climate Change 2001, 2007; Adger *et al.* 2007), and that it is "very likely" that it is largely due to increasing concentrations of greenhouse gases (carbon dioxide, methane, nitrous oxide, and others) in the global atmosphere from burning fossil fuels and other human activities (Cayan 2005, EPA Global Warming webpage http://yosemite.epa.gov; Adger *et al.* 2007). Eleven of the twelve years between 1995 and 2006 rank among the twelve warmest years since global temperatures began in 1850 (Adger *et al.* 2007). The warming trend over the last fifty years is nearly twice that for the last 100 years (Adger *et al.* 2007). Looking forward, under a high emissions scenario, the International Panel on Climate Change estimates that global temperatures will rise another four degrees centigrade by the end of this Century; even under a low emissions growth scenario, the International Panel on Climate Change estimates that the global temperature will go up another 1.8 degrees centigrade (International Panel on Climate Change 2001). The increase in global average temperatures affects certain areas more than others. The western United States, in general, is experiencing more warming than the rest of the Nation, with the 11 western states averaging 1.7 degrees Fahrenheit warmer temperatures than this region's average over the 20th Century (Saunders *et al.* 2008). California, in particular, will suffer significant consequences as a result of global warming (California Climate Action Team 2006). In California, reduced snowpack will cause more winter flooding and summer drought, as well as higher temperatures in lakes and coastal areas. The incidence of wildfires in the Golden State also will increase and the amount of increase is highly dependent upon the extent of global warming. No less certain than the fact of global warming itself is the fact that global warming, unchecked, will harm biodiversity generally and cause the extinction of large numbers of species. If the global mean temperatures exceed a warming of two to three degrees centigrade above pre-industrial levels, twenty to thirty percent of plant and animal species will face an increasingly high risk of extinction (International Panel on Climate Change 2001, 2007). The mechanisms by which global warming may push already imperiled species closer or over the edge of extinction are multiple. Global warming increases the frequency of extreme weather events, such as heat waves, droughts, and storms (International Panel on Climate Change 2001, 2007; California Climate Action Team 2006; Lenihan *et al.* 2003). Extreme events, in turn may cause mass mortality of individuals and significantly contribute to determining which species will remain or occur in natural habitats. Ongoing global climate change (Anonymous 2007; Inkley *et al.* 2004; Adger *et al.* 2007; Kanter 2007) likely imperils the delta smelt and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Conclusion

After reviewing the current status of the California red-legged frog, California tiger salamander and San Joaquin kit fox; the environmental baseline for the action area; the effects of the proposed Interstate 580 Eastbound Truck Climbing Lane Project and the cumulative effects; it is the Service's biological opinion that the project, as proposed, is likely to adversely affect all three species, but is not likely to jeopardize their continued existence. This determination is based on our opinion that the magnitude of the effects of this action does not appreciably reduce the likelihood of both the survival and recovery of these species in the wild.

INCIDENTAL TAKE STATEMENT

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 Caltrans so that they become binding conditions of any grant or permit issued to Caltrans, as appropriate, in order for the exemption in section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity covered by this incidental take statement. If Caltrans (1) fails to require Caltrans to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

California Red-Legged Frog

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect due to their cryptic nature and wariness of humans. Losses of this species may also be difficult to quantify due to a lack of baseline survey data and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the proposed action, the Service is quantifying take incidental to the proposed action as the mortality/harm of no more than two (2), and the harassment of all California red-legged frogs inhabiting or utilizing the 16.23 acres of suitable habitat identified in the biological assessment. The Service anticipates that take of juvenile and adult life history stages may be killed, harmed or

harassed as a result of habitat loss/degradation, construction-related disturbance, or capture and relocation efforts. Upon implementation of the following Reasonable and Prudent Measures, all juvenile and adult California red-legged frogs within the action area in accordance with the amount and type of take outlined above will become exempt from the prohibitions described under section 9 of the Act. No other forms of take are authorized under this opinion.

California Tiger Salamander

The Service anticipates that incidental take of the California tiger salamander will be difficult to detect due of their cryptic nature, subterranean lifestyle, and predominately nocturnal behavior. Losses of this species may also be difficult to quantify due to seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. Due to the difficulty in quantifying the number of California tiger salamanders that will be taken as a result of the proposed action, the Service is quantifying take incidental to the proposed action as the mortality/harm of two (2), and harassment of all California tiger salamanders inhabiting or utilizing the 16.23 acres of suitable habitat identified in the biological assessment. The Service anticipates that take of juvenile or adult California tiger salamanders may result from habitat loss/degradation, construction-related disturbance, or capture and relocation efforts. Upon implementation of the following Reasonable and Prudent Measures, all juvenile and adult California tiger salamanders within the action area in accordance with the amount and type of take outlined above will become exempt from the prohibitions described under section 9 of the Act. No other forms of take are authorized under this opinion.

San Joaquin Kit Fox

The Service expects that incidental take of the San Joaquin kit fox may be difficult to detect due to their nocturnal behavior and propensity to seek refuge within dens if injured, harassed or startled. Due to the difficulty in quantifying the number of San Joaquin kit fox that will be taken as a result of the proposed action, the Service is quantifying take incidental to the proposed action as the harm/harassment of all juvenile and adult San Joaquin kit fox inhabiting or utilizing the 101.04 acres of suitable denning and dispersal habitat within the action area as identified in the biological assessment as a result of habitat loss/degradation, or construction-related disturbance. No mortality of San Joaquin kit fox is authorized or anticipated as a result of the proposed action. Upon implementation of the following Reasonable and Prudent Measures, all juvenile and adult San Joaquin kit fox within the action area in accordance with the amount and type of take outlined above will become exempt from the prohibitions described under section 9 of the Act. No other forms of take are authorized under this opinion.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy of the California red-legged frog, California tiger salamander and San Joaquin kit fox, and is not likely to jeopardize the continued existence of these species.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effect of the proposed action on the California red-legged frog, California tiger salamander and San Joaquin kit fox:

1. Harassment, harm and/or mortality to the California red-legged frog, California tiger salamander and San Joaquin kit fox shall be minimized by fully implementing the Conservation Measures in this Biological Opinion, and adhering to the minimization measures described below in the Terms and Conditions.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Caltrans shall ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

    a. Caltrans shall include Special Provisions that include the Conservation Measures and the Terms and Conditions of this biological opinion in the solicitation for bid information for all contracts for the project that are issued by them to all contractors. In addition, Caltrans shall educate and inform contractors involved in the project as to the requirements of the biological opinion.

    b. To reduce the overall level of take of the California red-legged frog, California tiger salamander and San Joaquin kit fox, Caltrans shall compensate for the effect of take of species resulting from the net loss of habitat and temporal loss between the time the effects are incurred and the time when the compensation habitat is fully functional. The Service encourages Caltrans to seek habitat that comprises high quality breeding, foraging, sheltering, migration and/or dispersal habitat, or provides a functional linkage between areas of occupied habitat that facilitates the (re)colonization of suitable habitat from source populations. Caltrans shall comply with all applicable California Department of Fish and Game regulations pertaining to mitigation for species designated as fully protected and/or listed by the State. Caltrans shall submit a Conceptual Compensation Plan to the Service detailing on and off-site habitat compensation schemes – such as Tyler Ranch, potential land acquisition options, and timelines to achieve full habitat functions and values within 6 month following the issuance of this biological opinion. Compensation may consist of a combination of on and off-site habitat preservation, restoration and/or enhancement. Caltrans shall protect 18.56 acres of California red-legged frog, 18.56 acres of California tiger salamander, and 18.41 acres of San Joaquin kit fox habitat through a combination of the following options:

        i. **On-site Habitat Restoration**. Caltrans shall restore temporarily disturbed habitat(s), at a minimum, to original contours and baseline conditions. Credit for on-site restoration of areas subject to temporary disturbance shall be achieved once it is returned to and functions at baseline conditions or better as determined by the Service.

        ii. **Conservation Bank Credits**. Caltrans shall purchase conservation bank credits at a Service-approved conservation bank whose service area encompasses the action area for the species listed above. Conservation

credits shall be purchased and documentation provided to the Service comprising the Agreement for Sale of Conservation Credits, Bill of Sale, Payment Receipt and Updated Credit Ledger within 30 days prior to project ground-breaking.

iii. **Off-site Habitat Acquisition & In-perpetuity Preservation**. Caltrans shall contribute toward the acquisition of habitat approved by the Service. The habitat shall have a conservation easement or other appropriate entitlement, management plan, and endowment to manage the habitat in perpetuity; all of which shall be reviewed and approved by the Service, and completed within 18 months following project ground-breaking. Acquisition of land shall either be through easement or fee title. The conservation easement shall name the Service as a third-party beneficiary and shall be held by an entity qualified to hold conservation easements subject to Service approval. An endowment to manage the land and monitor the conservation easement shall be secured using an escrow account or other funding assurance acceptable to and approved by the Service. The endowment shall be held by a Service-approved entity in an amount agreed to by the Service. A management plan shall be developed prior to or concurrent to the acquisition of land and shall include, but is not limited to: a description of existing habitats and – if applicable – planned habitat creation, restoration and/or enhancement; monitoring criteria for California red-legged frog, California tiger salamander and San Joaquin kit fox; an integrated pest management and monitoring plan to control invasive species to the extent practicable; habitat creation, restoration and/or enhancement success criteria; and adaptive management strategies.

c. The Resident Engineer or their designee shall be responsible for implementing the Conservation Measures and Terms and Conditions of this Biological Opinion, and shall be the point of contact for the proposed action. The Resident Engineer or their designee shall maintain a copy of this Biological Opinion onsite whenever construction is in progress. Their name(s) and telephone number(s) shall be provided to the Service at least thirty (30) calendar days prior to ground-breaking at the project. Prior to ground-breaking, the Resident Engineer shall submit a letter to the Service verifying he/she is in possession of a copy of this Biological Opinion, and has read and understands the Conservation Measures and Terms and Conditions.

d. The Service-approved biologist(s) shall be onsite during all activities that may result in the take of the California red-legged frog, California tiger salamander and San Joaquin kit fox. The qualifications of the biologist(s) shall be presented to the Service for review and written approval at least thirty (30) calendar days prior to ground-breaking at the project site. The Service-approved biologist(s) shall keep a copy of this Biological Opinion in their possession when onsite. The Service-approved biologist(s) shall be given the authority to communicate verbally or by telephone, email or hardcopy with Caltrans personnel, construction personnel or any other person(s) at the project site or otherwise associated with the project. The Service-approved biologist(s) shall have oversight over implementation of the Terms and Conditions in this Biological Opinion, and shall, in consultation with the Resident Engineer, have the authority to stop project

activities if they determine any of the requirements associated with these Terms and Conditions are not being fulfilled. If the Service-approved biologist(s) exercises this authority, the Service shall be notified by telephone and email within 24 hours. The Service contact is Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office at telephone (916) 414-6600.

e. There shall be an adequate number of Service-approved biologists to monitor the effects of the project on the California red-legged frog, California tiger salamander and San Joaquin kit fox. The number of Service-approved biologists who are on site shall be determined by the Service, CDFG, and/or the Caltrans biologist.

f. The Service-approved biologist shall maintain monitoring records that include: (1) the beginning and ending time of each day's monitoring effort; (2) a statement identifying the species, including general wildlife species, were encountered, including the time and location when such species were found; (3) the time the specimen was identified and by whom and its condition; and (4) a description of any actions taken. The biological monitor shall maintain complete records in their possession while conducting monitoring activities and shall immediately surrender records to the Service upon request. All monitoring records shall be provided to the Service within 30 of the completion of monitoring work.

g. If verbally requested through the Resident Engineer or Construction Inspector, before, during, or upon completion of ground breaking and construction activities, Caltrans shall ensure the Service, CDFG, and/or their designated agents can immediately and without delay, access and inspect the project site for compliance with the proposed project description, conservation measures, and terms and conditions of this Biological Opinion, and to evaluate project effects to the California red-legged frog, California tiger salamander, San Joaquin kit fox and their habitat.

h. Caltrans shall require as part of the construction contract that all contractors comply with the Act in the performance of the work as described in the Project Description of this Biological Opinion. The contractor(s) may independently seek off-site staging locations outside of the Caltrans right-of-way, which shall be subject to the requirements of endangered species consultations with the Service and CDFG. In such cases, all agency permits, agreements, or consultations for off-site staging locations shall be the responsibility of the contractor(s).

Reporting Requirements

Proof of environmental training and fulfillment of compensation requirements shall be provided to the Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Room W-2605, Sacramento, California 95825-1846. Observations of California red-legged frog, California tiger salamander, San Joaquin kit fox, or any other listed or sensitive animal species should be reported to the California Natural Diversity Database (CNDDB) within thirty (30) calendar days of the observation.

Injured California red-legged frog, California tiger salamander and San Joaquin kit fox must be cared for by a licensed veterinarian or other qualified person such as the Service-approved biologist. Dead animals shall be placed in a zip-lock® plastic storage bag with a piece of paper indicating the date, time, location and name of the person who found it. The bag shall be placed in a freezer located in a secure location until instructions are received from the Service regarding the disposition of the specimen or until the Service takes custody of the specimen. The Service must be notified within 24 hours of the discovery of death or injury resulting from project-related activities or is observed at the project site. Notification shall include the date, time, and location of the incident or finding of a dead or injured animal clearly indicated on a USGS 7.5-minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. The Service contacts are Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office at Chris_Nagano@fws.gov and (916) 414-6600, and Dan Crum, Resident Agent-in-Charge Dan Crum of the Service's Law Enforcement Division at (916) 414-6660.

Caltrans shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the California red-legged frog, California tiger salamander and San Joaquin kit fox, if any; (v) occurrences of incidental take of these species, if any; (vi) documentation of employee environmental education; and (vii) other pertinent information. The reports shall be addressed to the Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Room W-2605, Sacramento, California 95825-1846.

Caltrans shall report to the Service any information about take or suspected take of listed wildlife species not authorized by this biological opinion. Caltrans must notify the Service via electronic mail and telephone within twenty-four (24) hours of receiving such information. Notification must include the date, time, location of the incident or of the finding of a dead or injured animal, and photographs of the specific animal. The individual animal shall be preserved, as stated above, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contacts are Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office at Chris_Nagano@fws.gov and (916) 414-6600, and Resident Agent-in-Charge Dan Crum of the Service's Law Enforcement Division at (916) 414-6660.

CONSERVATION RECOMMENDATIONS

Conservation recommendations are suggestions of the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of new information. These measures may serve to further minimize or avoid the adverse effects of a proposed action on listed, proposed, or candidate species, or on designated critical habitat. They may also serve as suggestions on how action agencies can assist species conservation in furtherance of their responsibilities under section 7(a)(1) of the Act, or recommend studies improving an understanding of a species' biology or ecology. Wherever

possible, conservation recommendations should be tied to tasks identified in recovery plans. The Service is providing you with the following conservation recommendations:

1. Caltrans should assist the Service in implementing recovery actions identified in the *Recovery Plan for the California Red-legged Frog* (Service 2002), and *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998).

2. Caltrans should consider participating in the planning for a regional habitat conservation plan for the California red-legged frog, California tiger salamander, San Joaquin kit fox, and other listed and sensitive species in Alameda County.

3. Caltrans should consider establishing functioning preservation and creation conservation banking systems to further the conservation of the California red-legged frog, California tiger salamander, San Joaquin kit fox, and other appropriate species. Such banking systems also could possibly be utilized for other required mitigation (i.e., seasonal wetlands, riparian habitats, etc.) where appropriate.

4. Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game. 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.

5. Caltrans should incorporate culverts, tunnels, or bridges on highways and other roadways that allow safe passage by California red-legged frog, California tiger salamander, San Joaquin kit fox, and other listed and common animals. Caltrans should include photographs, plans, and other information in their biological assessments if they incorporate "wildlife friendly" crossings into their projects.

6. Caltrans should provide roosting habitat for bats, when designing bridges, overpasses and other suitable structures whenever possible.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and/or proposed species or their habitats, the Service requests notification of the implementation of these recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the proposed Interstate 580 Eastbound Truck Climbing Lane Project, Alameda County, California. As provided in 50 CFR §402.16 and in the terms and conditions of this biological opinion, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (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. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have questions concerning this opinion on the proposed Interstate 580 Eastbound Truck Climbing Lane Project, Alameda County, California, Jerry Roe or Ryan Olah at the letterhead address or at (916) 414-6600.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
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Personal Communication

Mueller, Mark. 2008. Senior Water Resource Specialist. Contra Costa Water Department. Phone conversation with Jerry Roe. December 1.

Appendix H: Preliminary Project Plans

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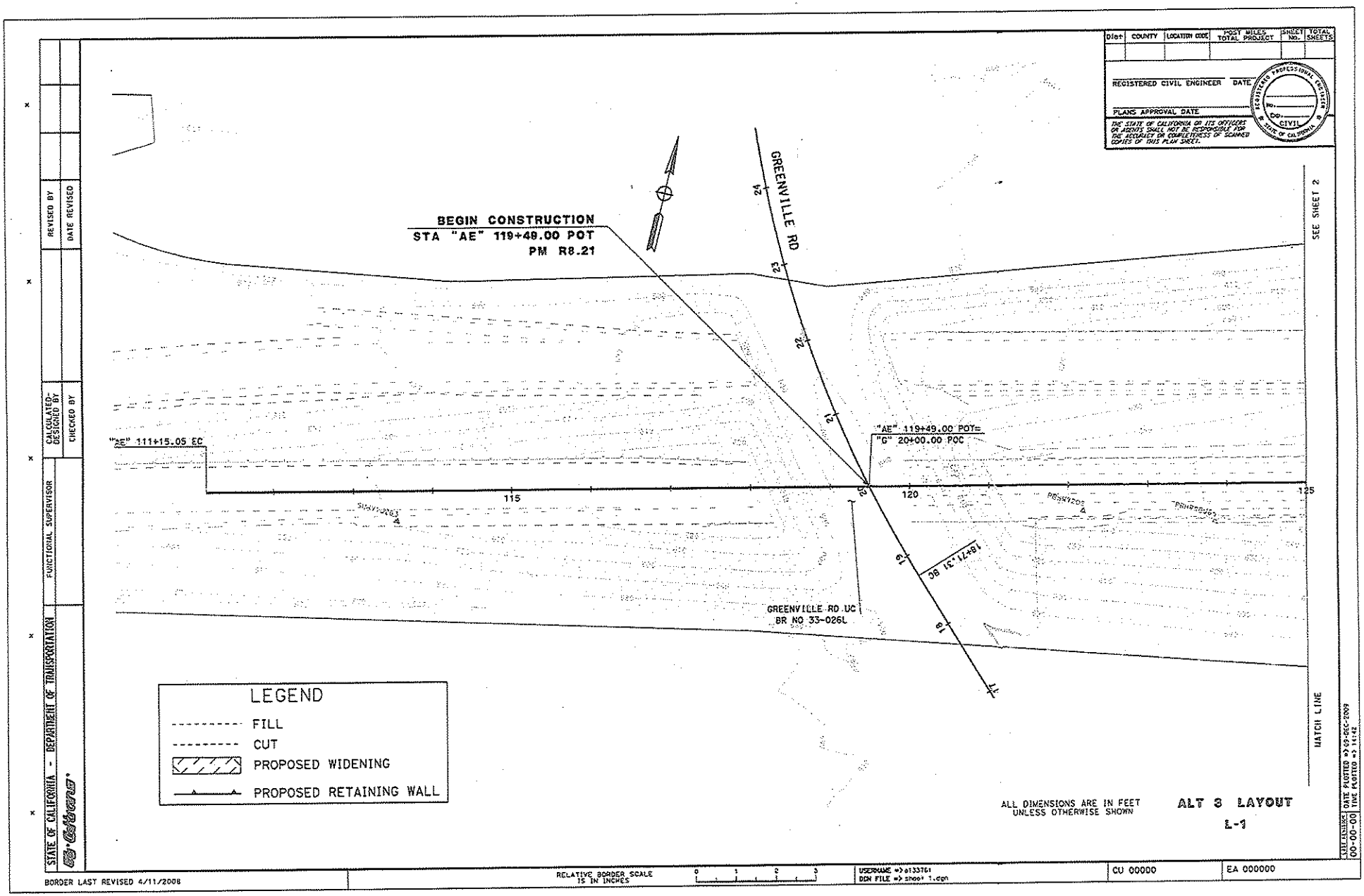
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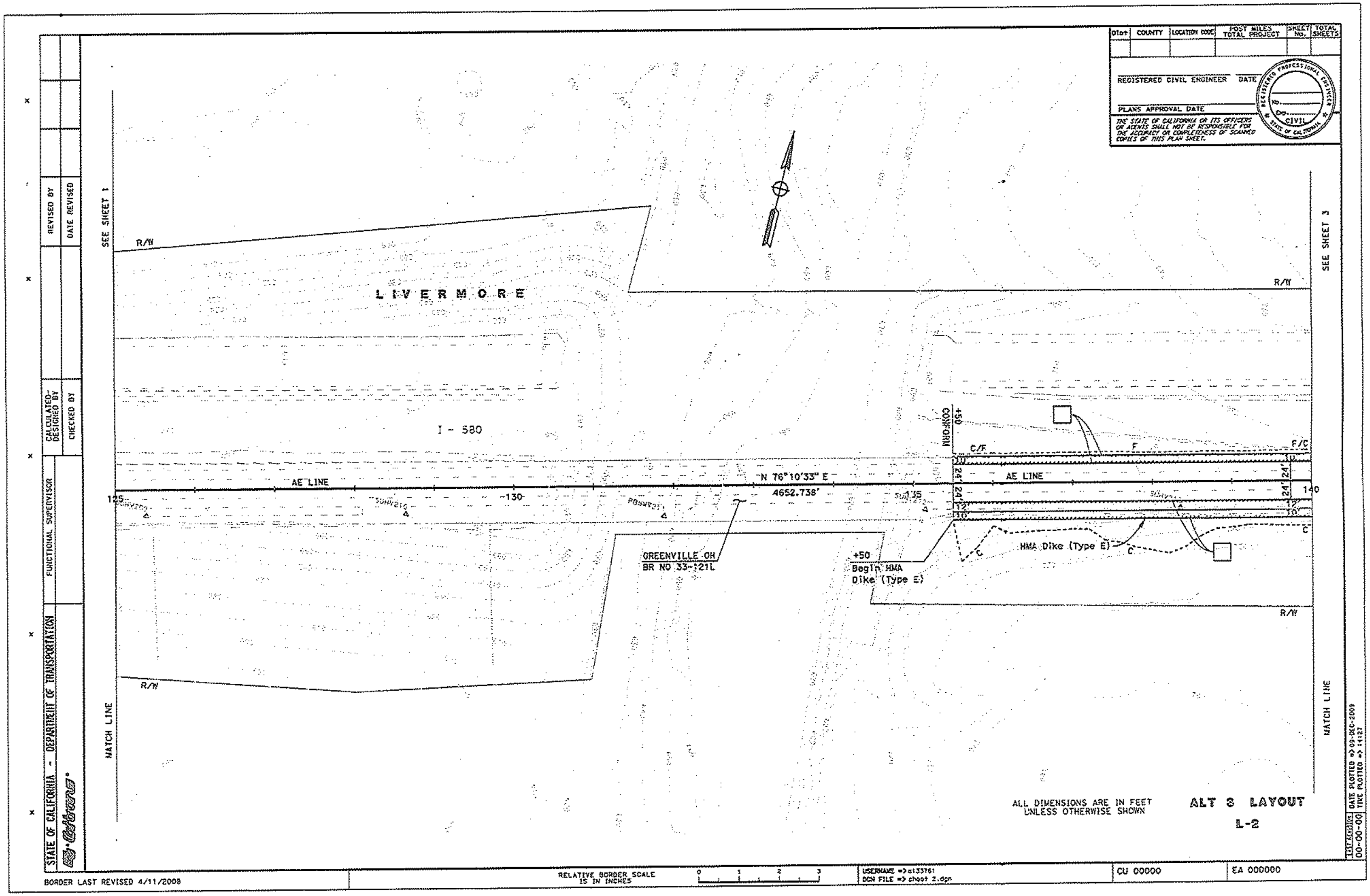

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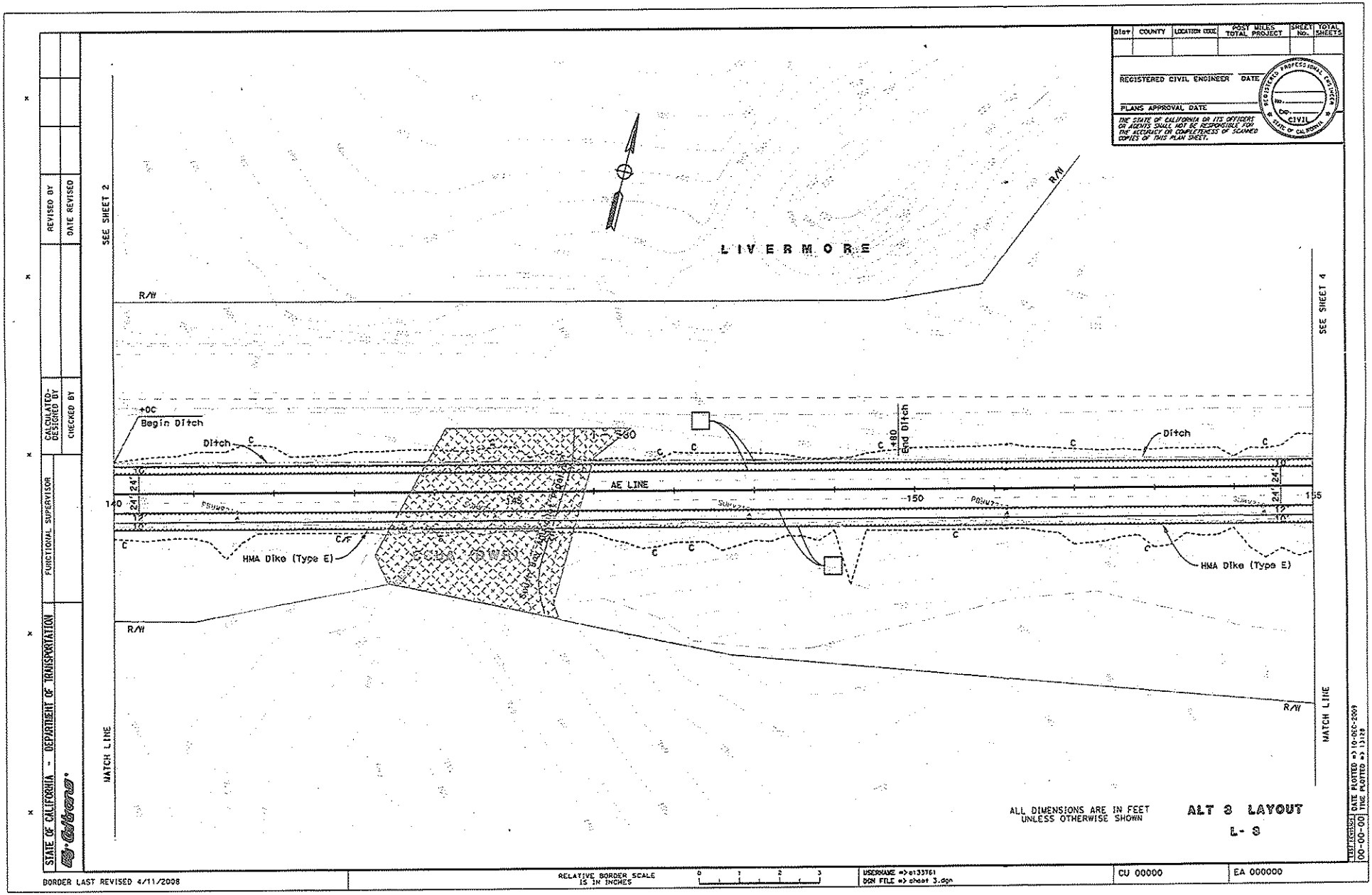

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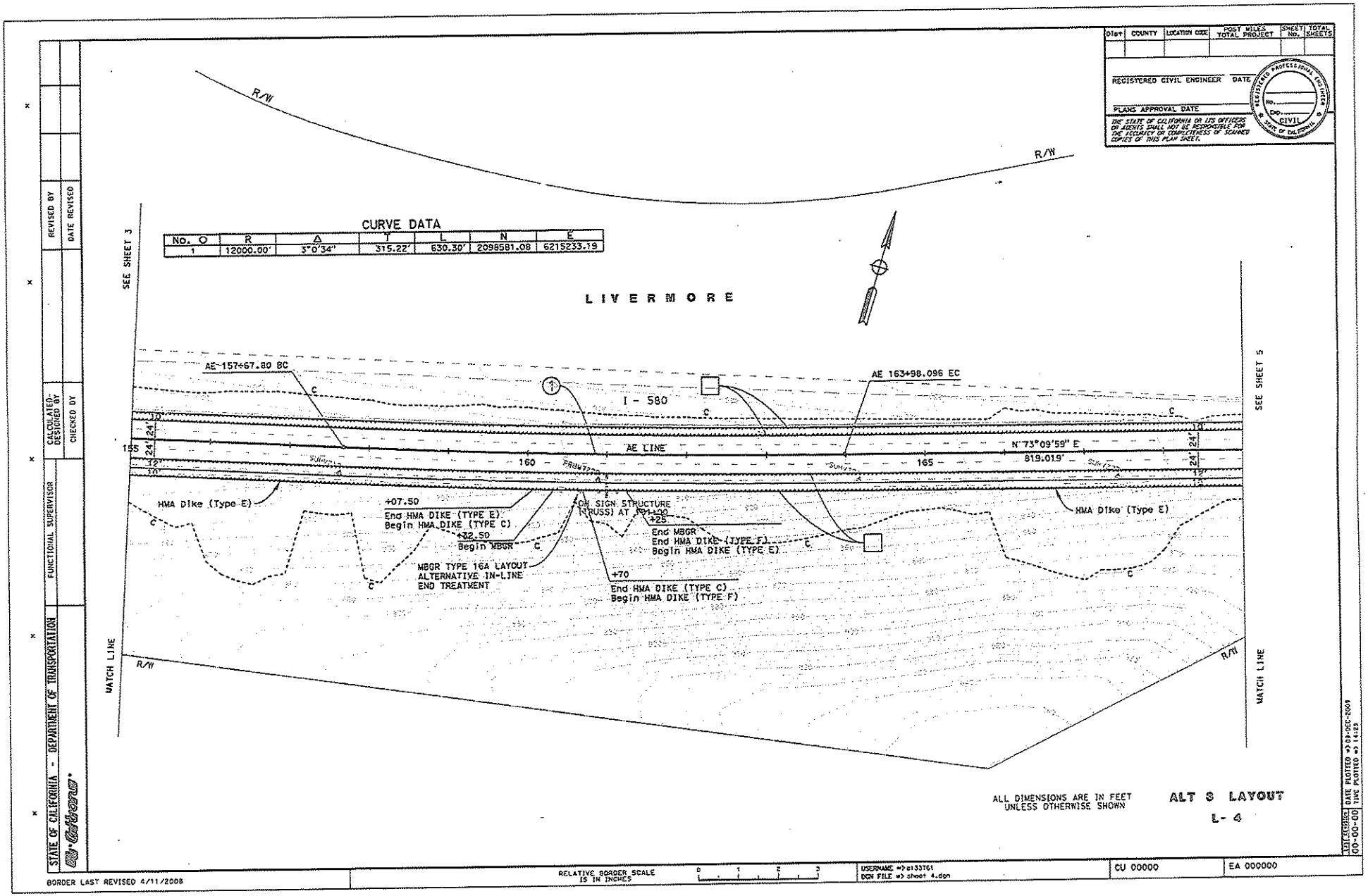

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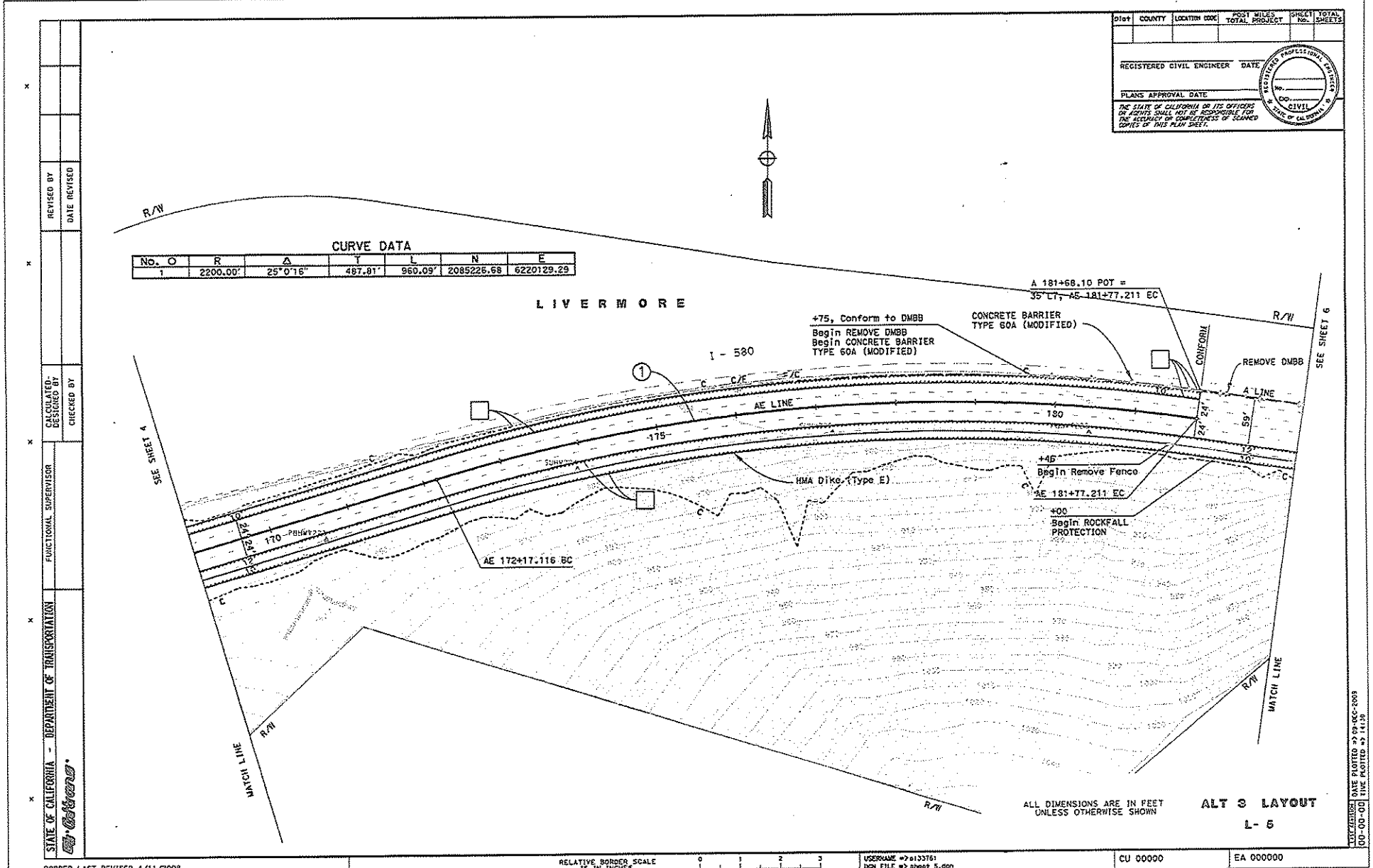
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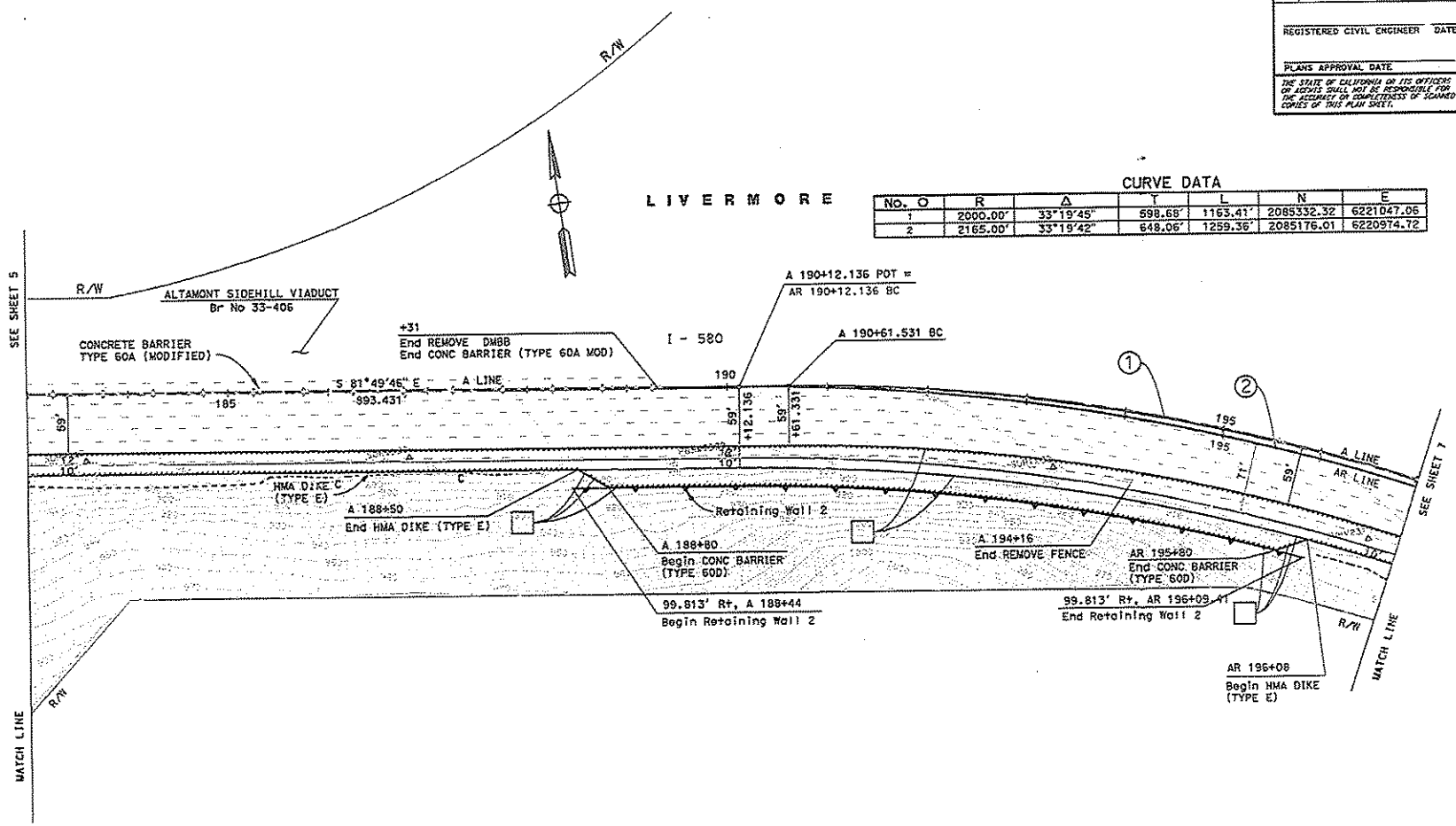
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DIST | COUNTY | LOCATION CODE | POST MILES TOTAL PROJECT | SHEET NO. | TOTAL SHEETS
REVISED BY | DATE REVISED
CALCULATED-DESIGNED BY | CHECKED BY
FUNCTIONAL SUPERVISOR
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN
ALT 5 LAYOUT
L- 6
BORDER LAST REVISED 4/11/2008
RELATIVE BORDER SCALE
IS IN INCHES
0 1 2 3
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DGN FILE => sheet 6.dgn
CU 00000
EA 000000
DATE PLOTTED => 09-DEC-2009
TIME PLOTTED => 14:31

Dist	COUNTY	LOCATION CODE	HWY MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

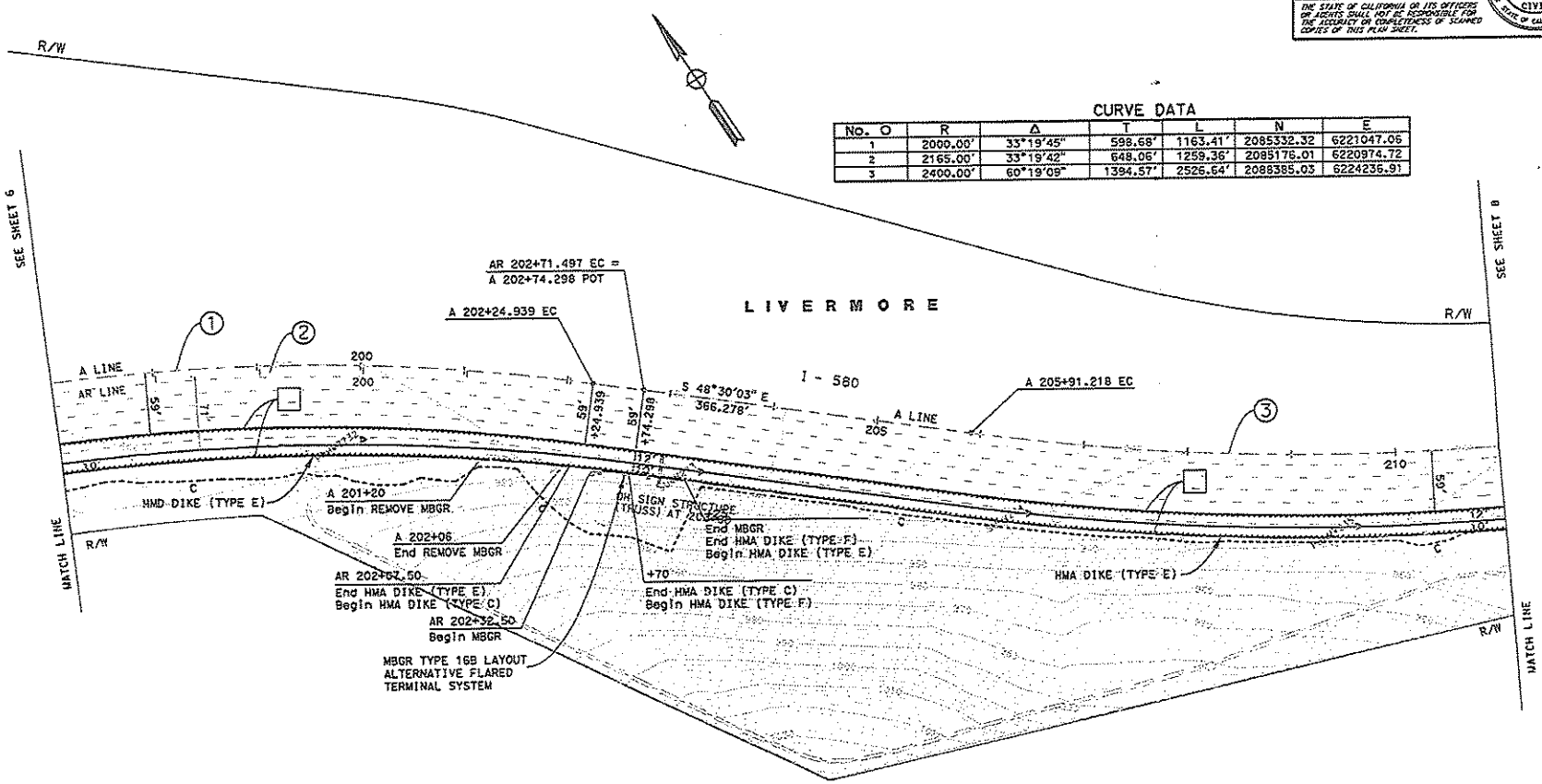
PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER — CIVIL — STATE OF CALIFORNIA

CURVE DATA

No. ⌀	R	Δ	T	L	N	E
1	2000.00'	33°19'45"	598.68'	1163.41'	2085332.32	6221047.06
2	2165.00'	33°19'42"	648.06'	1259.36'	2085176.01	6220974.72
3	2400.00'	60°19'09"	1394.57'	2526.64'	2088385.03	6224236.91



ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN

ALT 3 LAYOUT

L- 7

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY

CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE
IS IN INCHES
0 1 2 3

USERNAME => s133761
DGN FILE => sheet 7.dgn

CU 00000

EA 000000

DIST/COUNTY/ROUTE
00-00-00
DATE PLOTTED => 09-DEC-2009
TIME PLOTTED => 14:31

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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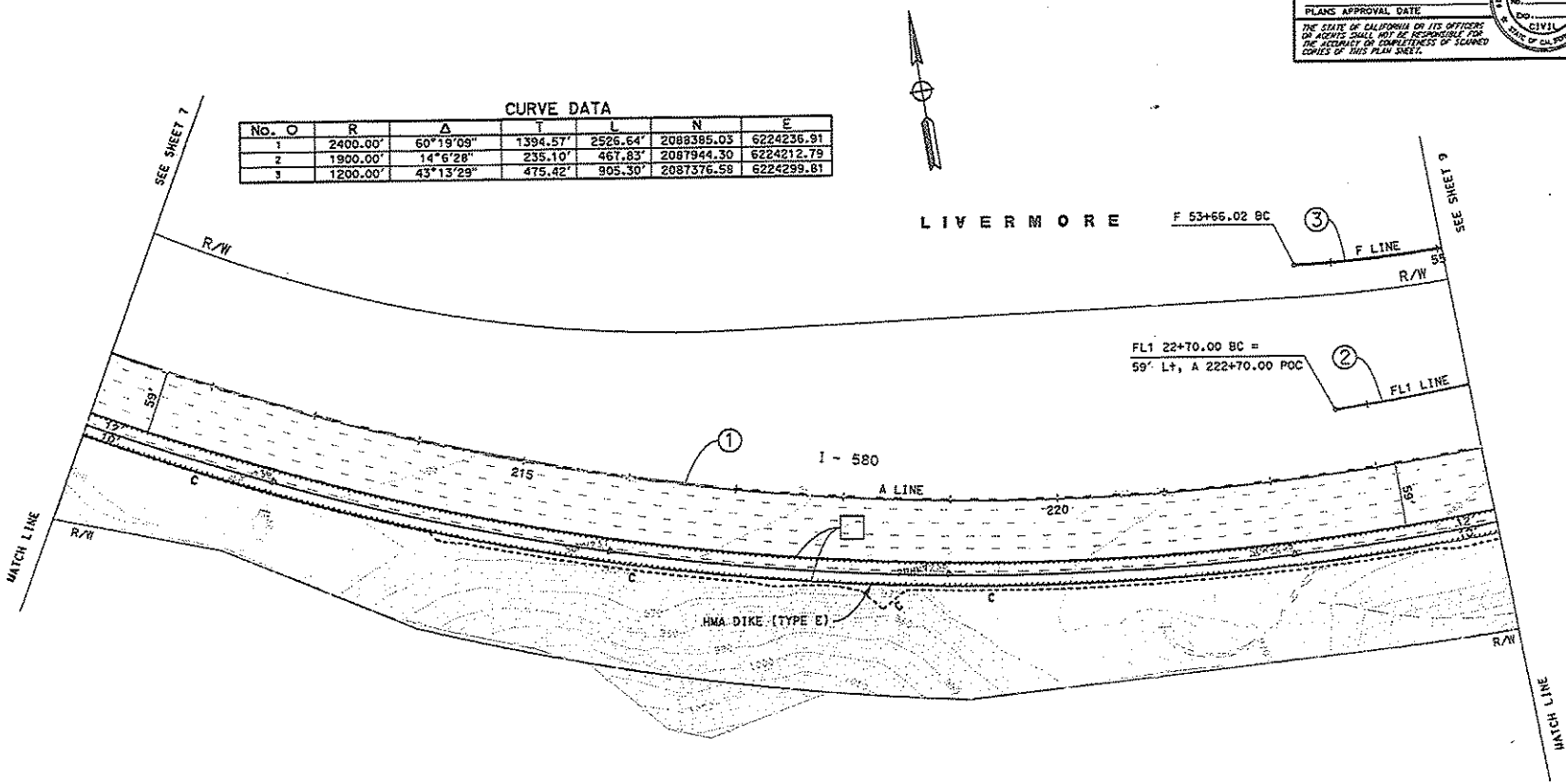
REGISTERED PROFESSIONAL ENGINEER — No. — CIVIL — STATE OF CALIFORNIA

CURVE DATA

No. ○	R	Δ	T	L	N	E
1	2400.00'	60°19'09"	1394.57'	2526.64'	2088385.03	6224236.91
2	1900.00'	14°6'28"	235.10'	467.83'	2087944.30	6224212.79
3	1200.00'	43°13'29"	475.42'	905.30'	2087376.58	6224299.81



ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

ALT 8 LAYOUT

L-8

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY

CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

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CU 00000

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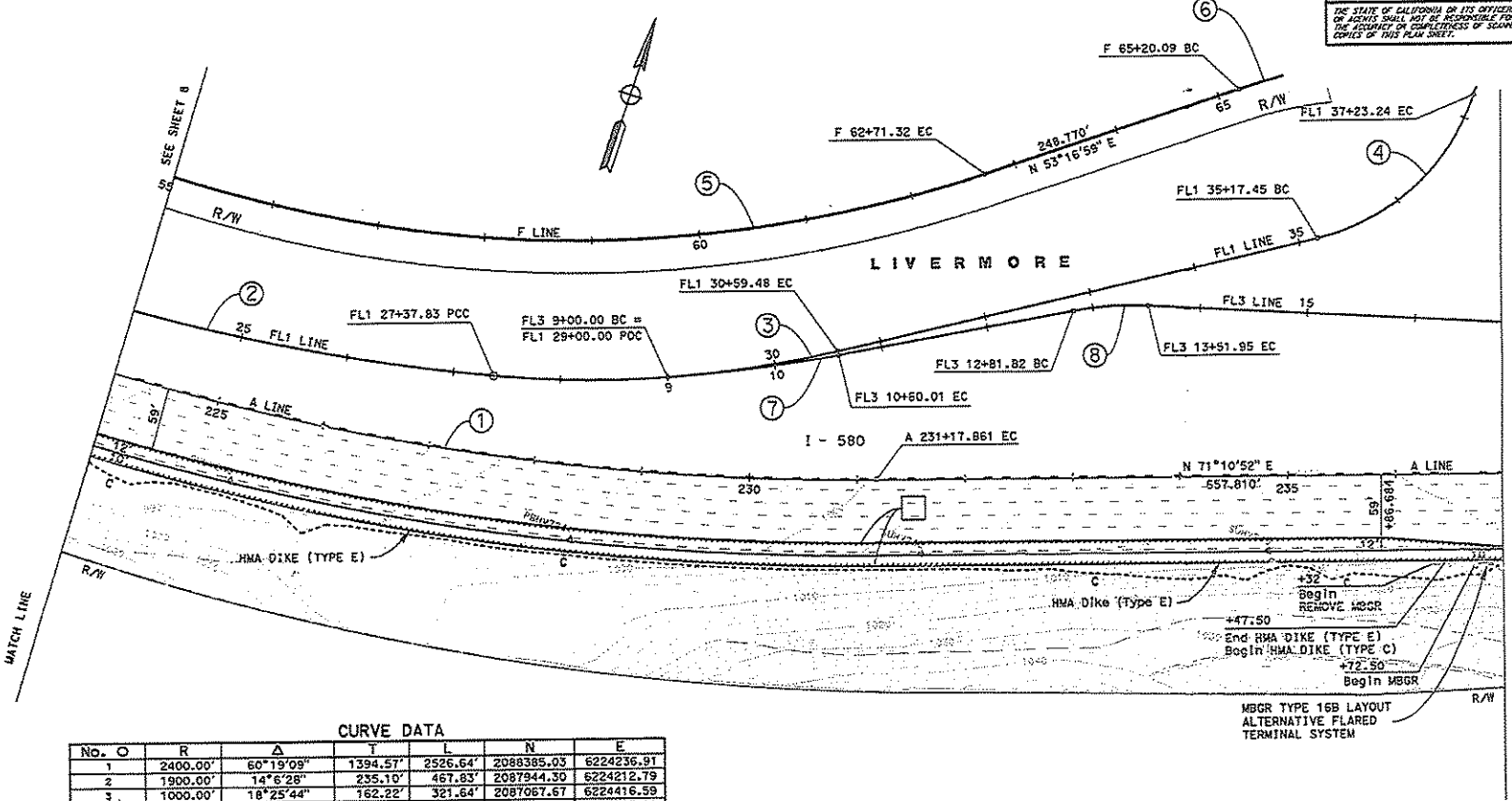
COLLECTION: 00-00-001 DATE PLOTTED => 09-DEC-2009 TIME PLOTTED => 14:32



CURVE DATA

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2	1900.00'	14°6'28"	235.10'	467.83'	2087944.30	6224212.79
3	1000.00'	18°25'44"	162.22'	321.64'	2087067.67	6224416.59
4	200.00'	58°57'18"	113.05'	205.79'	2086625.09	6225225.20
5	1200.00'	43°13'29"	475.42'	905.30'	2087376.58	6224299.81
6	1200.02'	11°59'01"	125.95'	250.99'	2085601.45	6225934.10
7	1400.00'	6°32'54"	80.09'	160.01'	2087437.55	6224264.29
8	300.00'	13°23'40"	35.23'	70.13'	2086056.95	6225280.73

ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN

ALT 3 LAYOUT

L- 9

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER — No. — CIVIL — STATE OF CALIFORNIA

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

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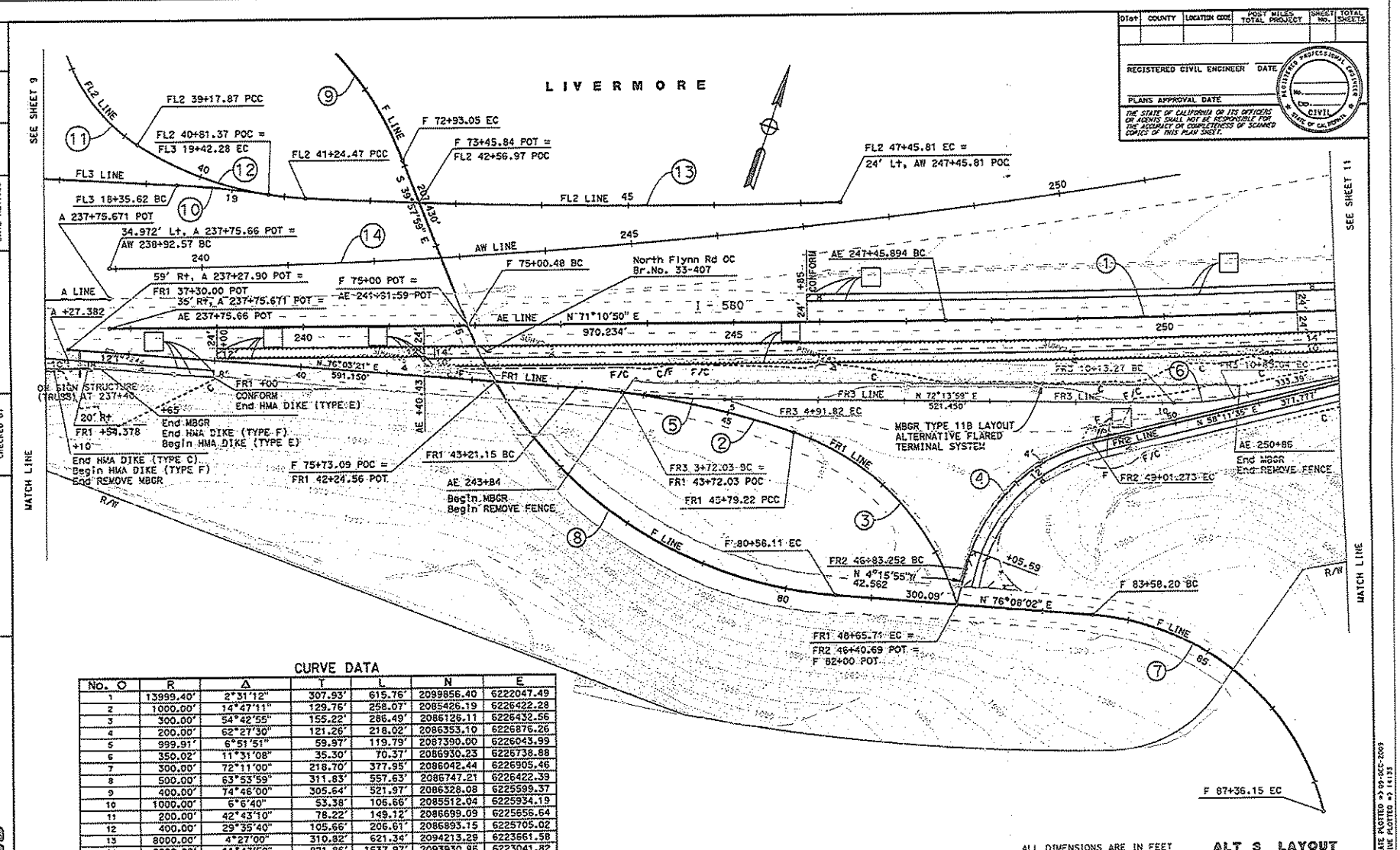

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4	200.00'	62°27'30"	121.26'	218.02'	2086353.10	6226876.26
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6	350.02'	11°31'08"	35.30'	70.37'	2086930.23	6226738.88
7	300.00'	72°11'00"	218.70'	377.95'	2086042.44	6226905.46
8	500.00'	63°53'59"	311.83'	557.63'	2086747.21	6226422.39
9	400.00'	74°46'00"	305.64'	521.97'	2086328.08	6225599.37
10	1000.00'	6°6'40"	53.38'	106.66'	2085512.04	6225934.19
11	200.00'	42°43'10"	78.22'	149.12'	2086699.09	6225658.64
12	400.00'	29°35'40"	105.66'	206.61'	2086893.15	6225705.02
13	8000.00'	4°27'00"	310.82'	621.34'	2094213.29	6223661.58
14	8000.00'	11°43'52"	821.86'	1637.97'	2093930.96	6223041.82

ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN

ALT 3 LAYOUT

L- 10

DIST	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

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CU 00000

EA 000000

DATE PLOTTED => 09-DEC-2009
TIME PLOTTED => 14:13

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Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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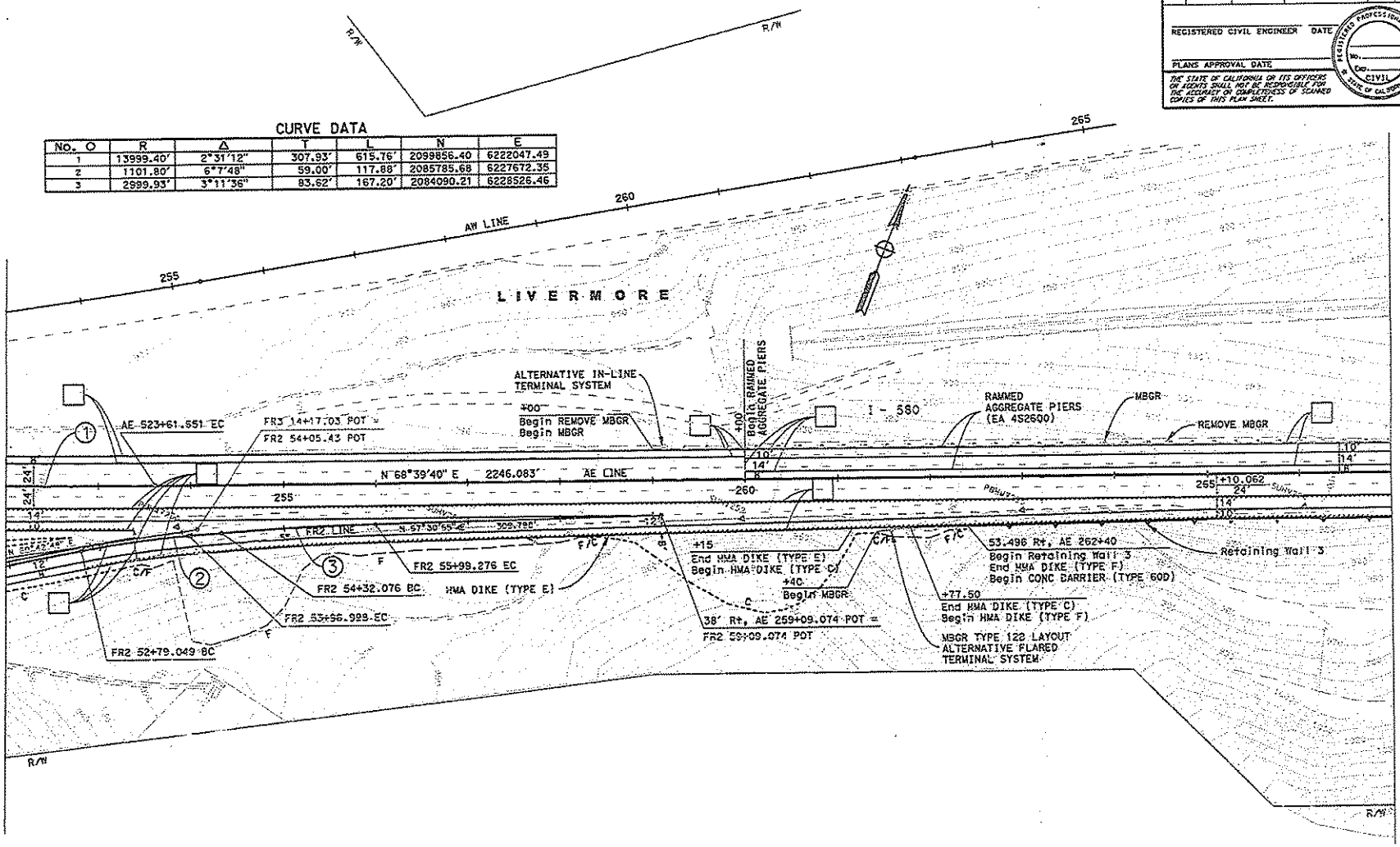
REGISTERED PROFESSIONAL ENGINEER — CIVIL — STATE OF CALIFORNIA

CURVE DATA

No. ○	R	Δ	T	L	N	E
1	13999.40'	2°31'12"	307.93'	615.76'	2099856.40	6222047.49
2	1101.80'	6°7'48"	59.00'	117.88'	2085785.68	6227672.35
3	2999.93'	3°11'36"	83.62'	167.20'	2084090.21	6228526.46



ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

ALT 3 LAYOUT

L-11

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY

CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA — DEPARTMENT OF TRANSPORTATION

Caltrans

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

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CU 00000

EA 000000

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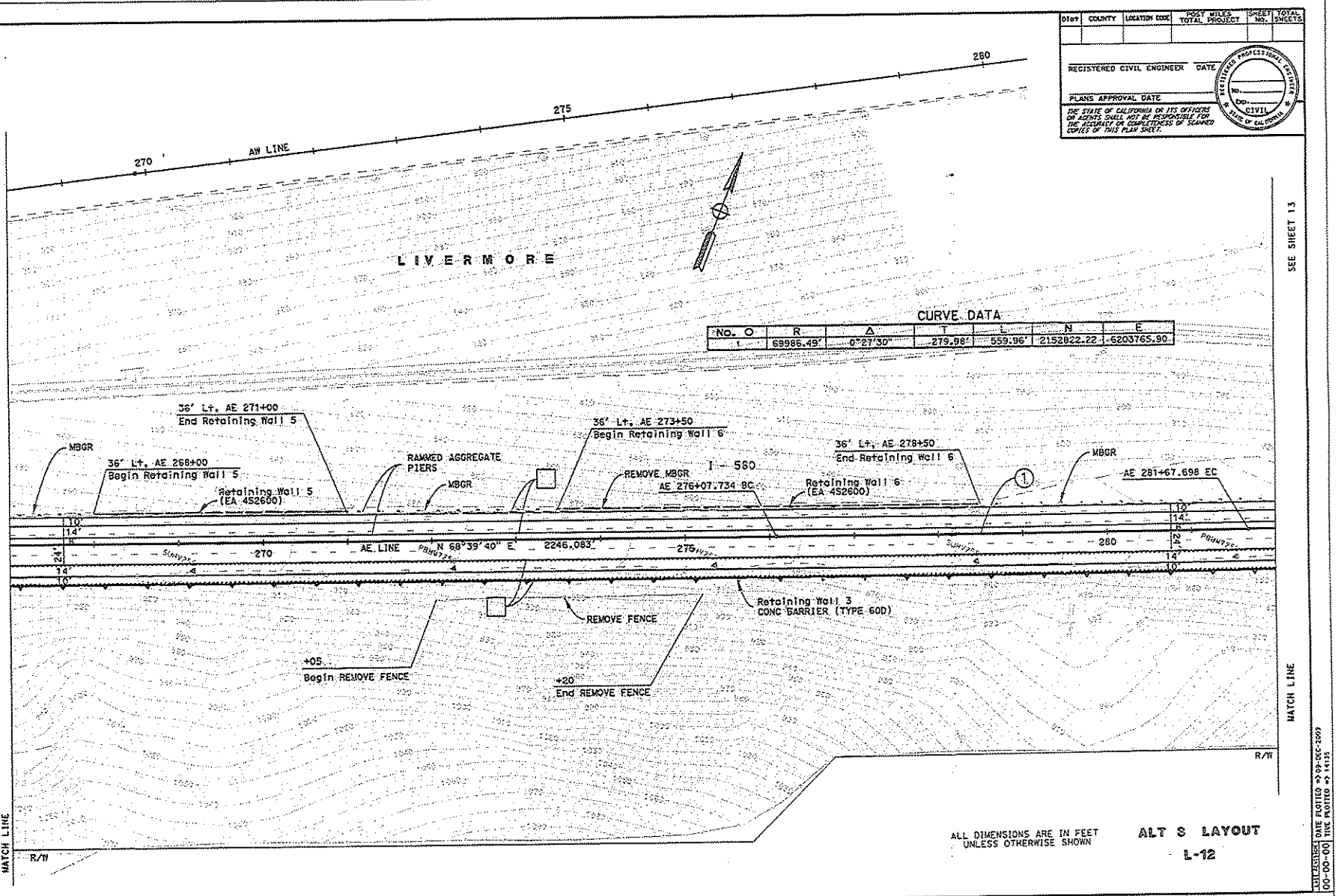
SEE SHEET 11
SEE SHEET 13
MATCH LINE
MATCH LINE
AW LINE
LIVERMORE
I - 580
CURVE DATA
NO. O R Δ T L N E
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36' Lt, AE 271+00
End Retaining Wall 5
36' Lt, AE 268+00
Begin Retaining Wall 5
MBGR
Retaining Wall 5
(EA 4S2600)
RAMMED AGGREGATE
PIERS
MBGR
36' Lt, AE 273+50
Begin Retaining Wall 6
REMOVE MBGR
AE 276+07.734 BC
Retaining Wall 6
(EA 4S2600)
36' Lt, AE 278+50
End Retaining Wall 6
MBGR
AE 281+67.698 EC
AE LINE
N 68°39'40" E
2246.083
270
275
280
Retaining Wall 3
CONC BARRIER (TYPE 60D)
REMOVE FENCE
+05
Begin REMOVE FENCE
+20
End REMOVE FENCE
R/W
R/W
ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN
ALT 8 LAYOUT
L-12
REVISED BY
DATE REVISED
CALCULATED-DESIGNED BY
CHECKED BY
FUNCTIONAL SUPERVISOR
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
DIST COUNTY LOCATION CODE POST MILES TOTAL PROJECT SHEET NO. TOTAL SHEETS
REGISTERED CIVIL ENGINEER DATE
PLANS APPROVAL DATE
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REGISTERED PROFESSIONAL ENGINEER
CIVIL
STATE OF CALIFORNIA
REVISION DATE PLOTTED => 09-DEC-2009
00-00-00 TIME PLOTTED => 14:35
BORDER LAST REVISED 4/11/2008
RELATIVE BORDER SCALE IS IN INCHES
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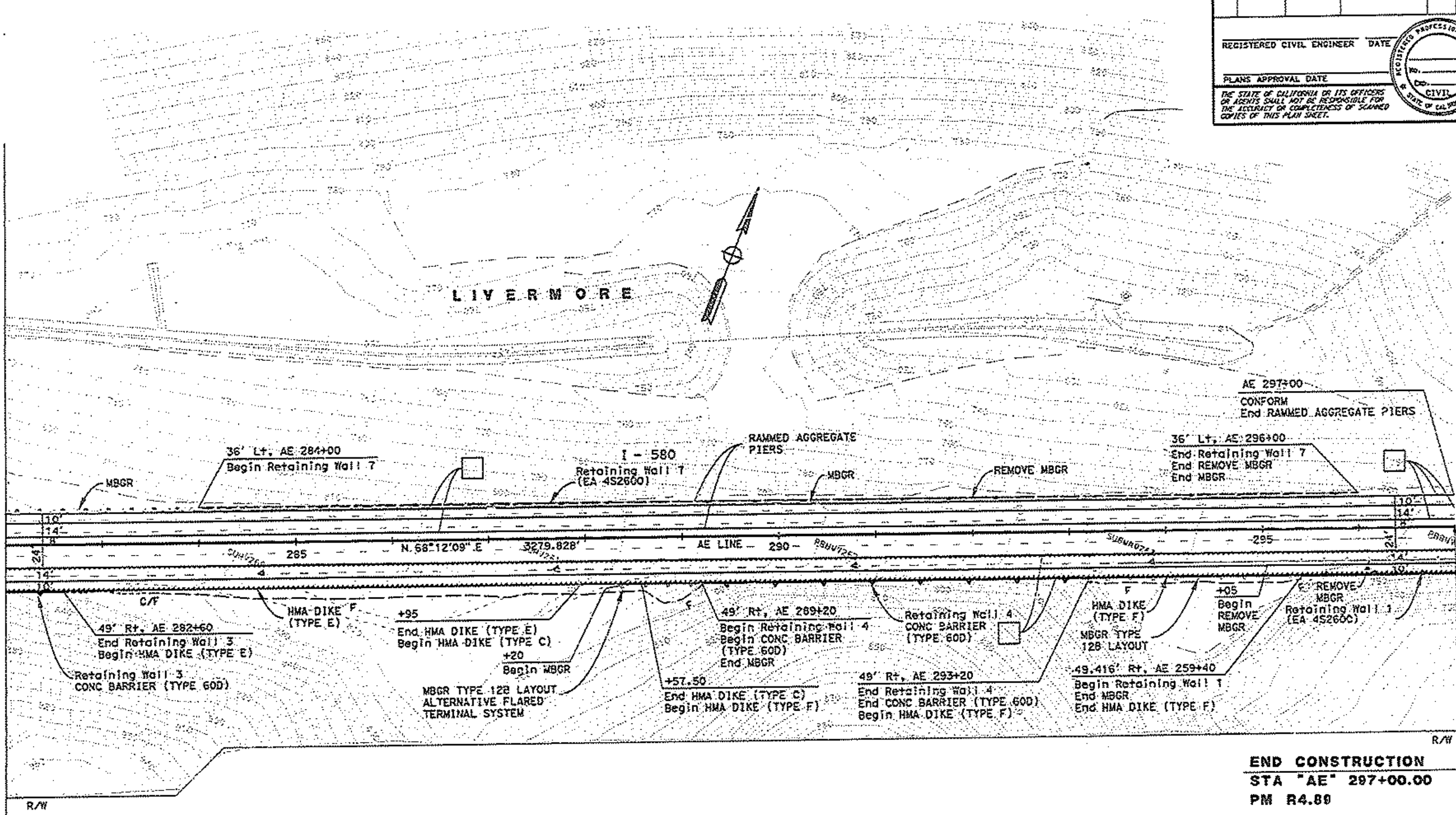
EA 000000



END CONSTRUCTION
STA "AE" 297+00.00
PM R4.89

SEE SHEET 12

MATCH LINE

ALL DIMENSIONS ARE IN FEET
UNLESS OTHERWISE SHOWN

ALT 3 LAYOUT
L-13

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY
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REVISED BY
DATE REVISED

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES
0 1 2 3

USERNAME => a133761
DGN FILE => sheet13.dgn

CU 00000

EA 000000

LAST REVISION 00-00-00
DATE PLOTTED => 10-DEC-2009
TIME PLOTTED => 03:11

Appendix I – FHWA Air Quality Conformity Determination

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U.S.Department
of Transportation
**Federal Highway
Administration**

**Federal Highway Administration
California Division**

650 Capitol Mall, Suite 4-100
Sacramento, CA 95814
(916) 498-5001
(916) 498-5008 (fax)

February 2, 2010

In Reply Refer To:
HDA-CA
EA 4A0700

Bijan Sartipi, District Director
California Department of Transportation
111 Grand Avenue
P.O. Box 23360
Oakland, CA 94612

Attention: Allen Baradar, Chief of Environmental Engineering

Dear Mr. Baradar:

SUBJECT: FHWA Project Level Conformity Determination for the I-580 Eastbound Truck Climbing Lane Project

On December 15, 2009, the California Department of Transportation (Caltrans) submitted to the Federal Highway Administration (FHWA) a request for a project level conformity determination for the I-580 Eastbound Truck Climbing Lane project in Alameda County. The project is in an area that is designated Nonattainment for Ozone and Maintenance for Carbon Monoxide (CO).

The project level conformity analysis submitted by Caltrans indicates that the transportation conformity requirements of 40 C.F.R. Part 93 have been met. The project is included in the Metropolitan Transportation Commission's (MTC) currently conforming *Transportation 2035 Plan (RTP)* and the *2009 Regional Transportation Improvement Program (RTIP).* The current conformity determinations for the RTP and RTIP were approved by FHWA and the Federal Transit Administration (FTA) on May 29, 2009. The design concept and scope of the preferred alternative have not changed significantly from those assumed in the regional emissions analysis.

As required by 40 C.F.R. 93.116 and 93.123, the localized CO analyses are included in the documentation. The CO hotspot analysis was conducted using the *Transportation Project-Level Carbon Monoxide Protocol.* The analyses demonstrate that the project will not create any new violation of the standards or increase the severity or number of existing violations.

Based on the information provided, FHWA finds that the Conformity Determination for the I-580 Eastbound Truck Climbing Lane project in Alameda County conforms to the State Implementation Plan (SIP) in accordance with 40 C.F.R. Part 93.

If you have any questions pertaining to this conformity finding, please contact Stew Sonnenberg, FHWA Air Quality Specialist, at (916) 498-5889.

Sincerely,

For
Walter C. Waidelich, Jr.
Division Administrator

cc: (email)
Glenn Kinoshita, Caltrans D-4
Mike Brady, Caltrans HQ
Aimee Kratovil, FHWA

SSonnenberg/ac