Appendix J

Intertie Terrestrial Biological Opinion

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-1156-1

OCT 29 2009

Memorandum

To: Michelle H. Denning, Regional Planning Officer, U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, California

From: ~~Field~~ Acting Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California Cliff Nagano

Subject: Section 7 Formal Consultation on the Delta-Mendota Canal/California Aqueduct Intertie Project, Alameda County, California

This is in response to the U.S. Bureau of Reclamation (Reclamation) September 15, 2009, request for initiation of formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Delta-Mendota Canal/California Aqueduct Intertie Project, Alameda County, California (Proposed Project). Your request was received in our office on September 18, 2009. This document represents the Service's biological opinion on the effects of the Proposed Project on the threatened California red-legged frog (*Rana aurora draytonii*) and the threatened California tiger salamander (*Ambystoma californiense*) under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

On February 15, 2005, the Service provided concurrence with Reclamation's determination that the Proposed Project (as proposed at the time) (Reclamation and San Luis Delta Mendota Water Authority [Authority] 2004) was not likely to adversely affect the California red-legged frog and the endangered San Joaquin kit fox (*Vulpes macrotis mutica*). However, due to changes in the description of the Proposed Project (e.g., the addition of the 4.5-mile long transmission line) and the recent finding of California red-legged frogs near the proposed footprint (Reclamation 2009a), the Service has determined that the Proposed Project is likely to adversely affect the California red-legged frog. The Service, however, has not changed its initial determination that the Proposed Project is not likely to adversely affect the San Joaquin kit fox. This determination is based on Reclamation's commitment to preconstruction surveys and implementation of the Service's standard recommendations for the protection of San Joaquin kit fox (Service 1999a,b). Implementation of these conservation measures will avoid injury or mortality of San Joaquin kit foxes. The proposed pipeline would be placed underground, and thus, would not be a barrier to San Joaquin kit fox movement. Also the amount of non-native annual grassland habitat within the Proposed Project that would be temporarily disturbed would be a small percentage of the available annual grassland habitat within the project area and would be restored within one growing season.

Although there are seasonal wetlands along the proposed transmission line route that are potential habitat for the endangered longhorn fairy shrimp (*Branchinecta longiantenna*) and the threatened vernal pool fairy shrimp (*Branchinecta lynchi*), the effects of the Proposed Project on these listed crustaceans would be minimized by limiting construction to the dry season, fencing the aquatic habitats to avoid encroachment from equipment or workers, and locating transmission poles as far from aquatic habitats as possible. Additionally, a construction risk management plan would be implemented to prevent fuel or oil leaks or spills from degrading aquatic habitat and control contamination (Reclamation 2009a). Therefore, based on your commitment to implementing these conservation measures and locating the transmission poles as far from aquatic habitats as possible, we concur with your determination that the Proposed Project is not likely to adversely affect the longhorn fairy shrimp and the vernal pool fairy shrimp.

This biological opinion is based on information provided in: (1) Reclamation's letter initiating formal consultation for the Proposed Project; (2) the September 2009 *Delta-Mendota Canal/California Aqueduct Intertie Project Biological Assessment* (Reclamation 2009a); (3) the March 2009 *Administrative Draft Delta-Mendota Canal/California Aqueduct Intertie Environmental Impact Statement* (Reclamation 2009b); (4) conversations with Brian Buttazoni and other Reclamation staff; and (5) other information available to the Service.

Consultation History

August 24, 2009: Joseph Terry of the Service received the July 2009 Draft Biological Assessment for the Proposed Project via e-mail.

August 25, 2009: Joseph Terry of the Service called Brian Buttazoni in response to Mr. Buttazoni's e-mail regarding the July 2009 Draft Biological Assessment for the Proposed Project. Mr. Buttazoni said that two more California red-legged frogs had been seen near the project footprint (pipeline route) last July. Mr. Terry and Mr. Buttazoni discussed compensation requirements for impacts to the California red-legged frog and California tiger salamander. Mr. Terry and Mr. Buttazoni also discussed the potential impacts of the Proposed Project on vernal pools along the proposed transmission line route. Mr. Buttazoni stated that the transmission poles could be located outside the vernal pools, but he did not know if a 250-foot buffer could be maintained around the vernal pools.

September 22, 2009: Joseph Terry of the Service received an e-mail from Brian Buttazoni (Reclamation) containing the September 2009 Biological Assessment for the Proposed Project (Reclamation 2009b) and associated figures.

BIOLOGICAL OPINION

Description of the Proposed Project

The Proposed Project consists of the intertie and a 4.5-mile long transmission line. Components of the intertie are a pumping plant, intake structure, pipelines, turnout structure, and switchyard (Intertie) (illustrated in Figure 1 below). A new inter-canal gravel access road would also be constructed. The Intertie would be located in northeastern Alameda County, California, about

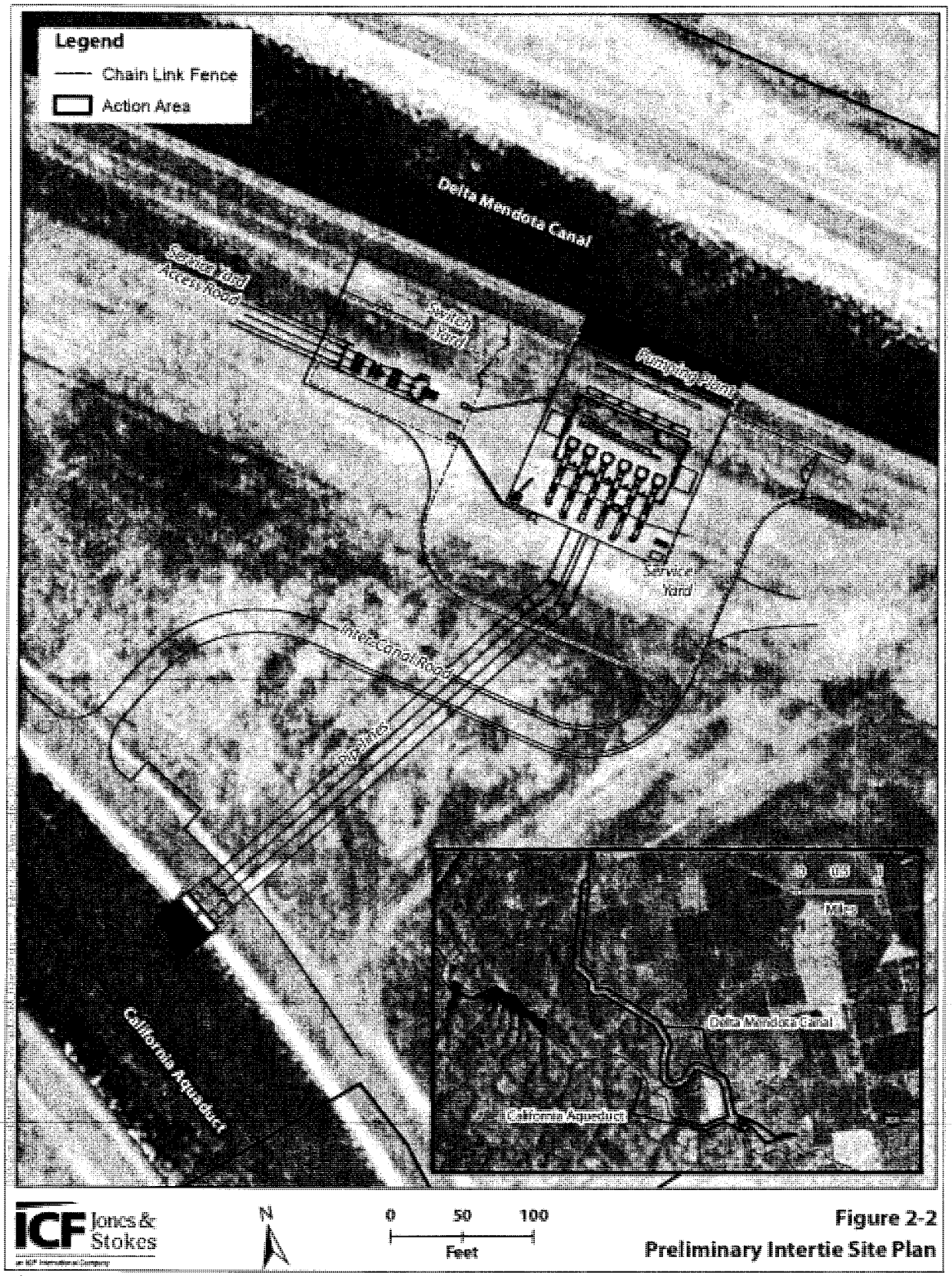

Figure 1. Preliminary Intertie Site Plan (copied from Figure 2-2 in Reclamation 2009a).

7.5 miles west of the City of Tracy, San Joaquin County, California, near Mile 7.2 of the Delta-Mendota Canal (DMC) and Mile 9 of the California Aqueduct, where the DMC and California Aqueduct are about 500 feet apart (see Figures 2 – 3 below).

The Intertie would allow the DMC and California Aqueduct to share conveyance capacity and could be used to convey water in either direction. To convey water from the DMC to the California Aqueduct, the Intertie would include a pumping plant at the DMC that would allow up to 467 cubic feet per second (cfs) to be pumped from the DMC to the California Aqueduct via an underground pipeline (Figure 1). This additional 467 cfs would allow the Jones Pumping Plant (located adjacent to the northern end of the action area in Figure 3) to pump at its designed and permitted maximum of 4,600 cfs. Additionally, water could be conveyed from the California Aqueduct to the DMC. Because the California Aqueduct is approximately 50 feet higher in elevation than the DMC, up to 900 cfs flow could be conveyed from the California Aqueduct to the DMC through the Intertie using gravity flow.

The Intertie would involve the installation of four electrically powered pumping units, each rated at 116.7-cfs capacity, within the pumping plant structure (Figure 1). Water would be withdrawn from the DMC through a conventional-style intake structure consisting of four bays (one bay for each of four pump units) with trashracks mounted flush with and parallel to the existing canal sideslope. Each intake bay would contain stoplog slots to allow isolation of the intake structure from the pumping plant sump. Water would be pumped uphill a vertical distance of about 50 feet through belowground pipelines and discharged into the California Aqueduct.

A switchyard would be located northwest of the pumping plant (Figure 1). A new power transmission line would be extended to the new switchyard site from the Tracy substation located 4.5 miles to the north (Figures 2 and 3). The operations and maintenance (O&M) roads along the DMC and California Aqueduct would be realigned to accommodate project structures. A new access road would connect the DMC and California Aqueduct, and a service yard would be constructed adjacent to the pumping plant. A pre-engineered steel building would be constructed at the southeast end of the project site and would house the pumping plant units and motor control equipment.

The Intertie would be owned by the Federal government and operated by the San Luis Delta Mendota Water Authority (Authority). An agreement among Reclamation, the California Department of Water Resources (DWR), and the Authority would identify the responsibilities and procedures for operating the Intertie. Reclamation would obtain a permanent easement for the portion of the Intertie alignment that is constructed on the state property.

Project Components

Components of the Proposed Project include the DMC pumping plant, intake structure, pipelines, turnout structure, switchyard, and transmission line. Each project component or set of components is described below.

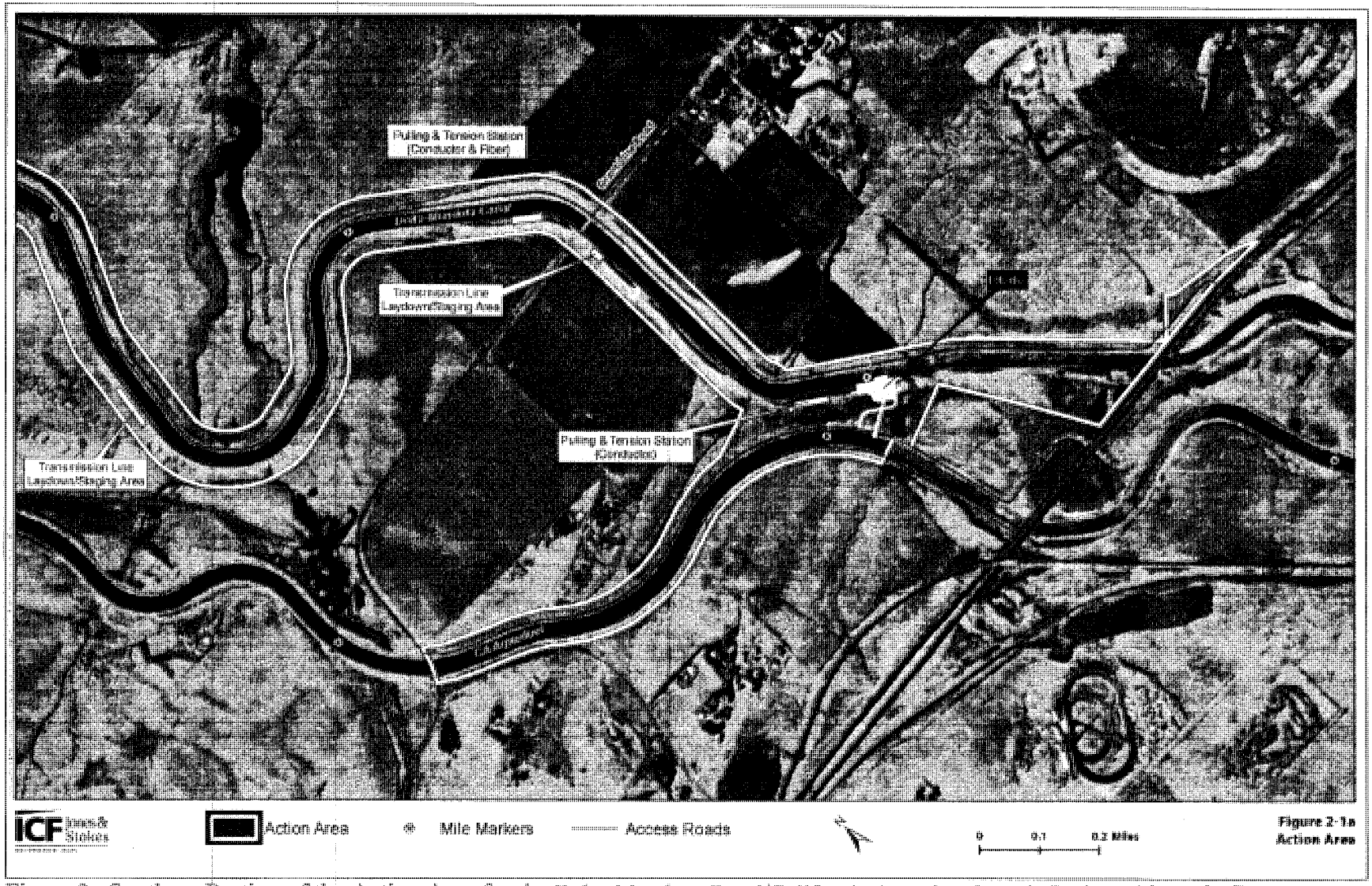

Figure 2. Southern Portion of the Action Area for the Delta-Mendota Canal/California Aqueduct Intertie Project, Alameda County, California (copied from Figure 2-1a in Reclamation 2009b).

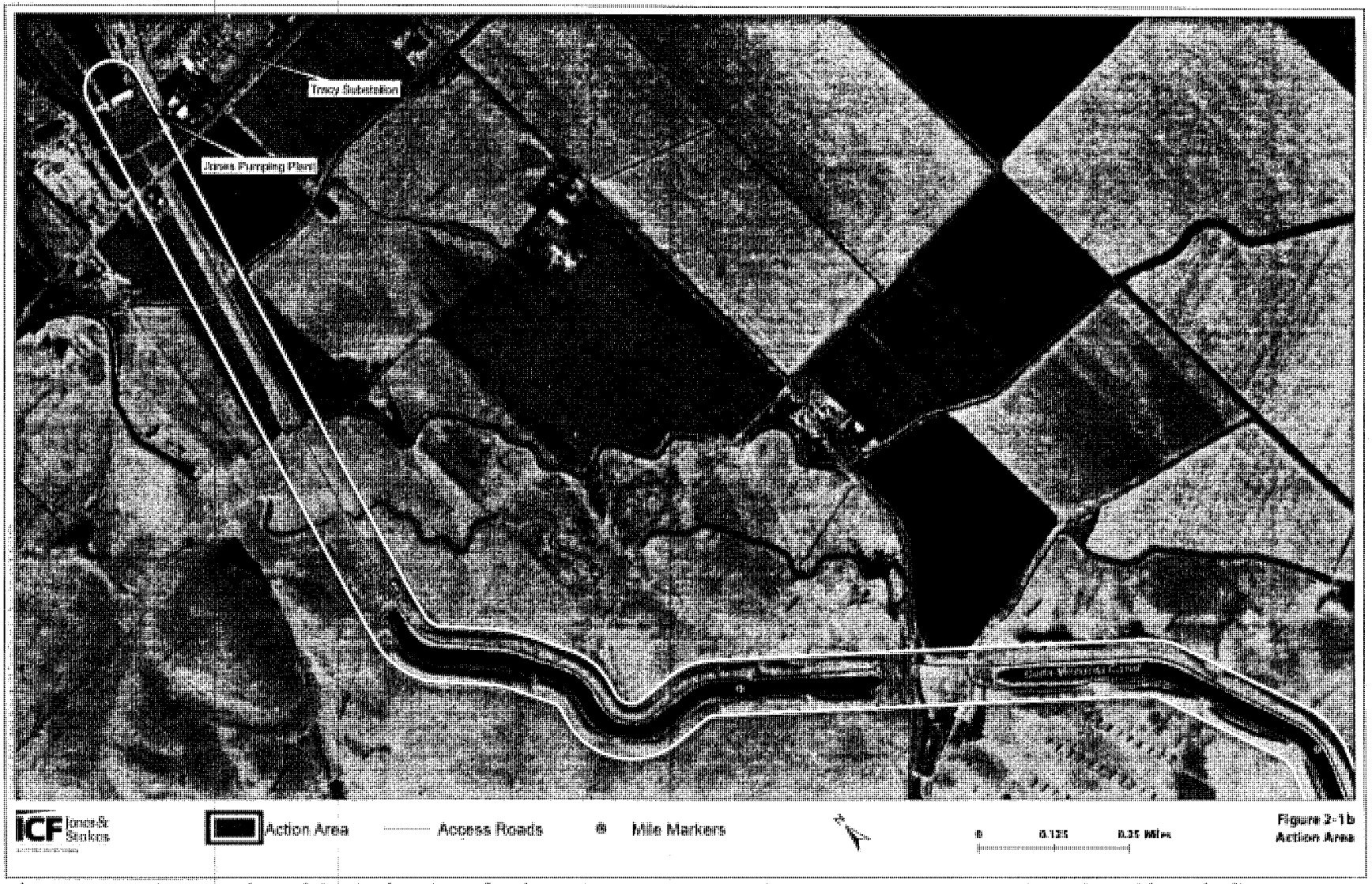

Figure 3. Northern Portion of the Action Area for the Delta-Mendota Canal/California Aqueduct Intertie Project, Alameda County, California (copied from Figure 2-1b in Reclamation 2009b).

DMC Pumping Plant, Intake Structure, and Pipelines

The primary project component of the Intertie would be a pumping plant with a total pumping capacity of 467 cfs, although the maximum average monthly pumping is expected to be around 400 cfs (Figure 1). Construction activity would begin with site excavation for the pumping plant. A sheet pile cofferdam would be installed on the DMC and dewatered to allow construction of the pumping plant intake. It is anticipated that the contractor would use a vibratory hammer for sheet pile installation for a period of 8 to 10 hours per day; cofferdam construction for the DMC intake would take approximately 6 days. The cofferdam would be dewatered prior to the removal of the canal lining. Once this is accomplished, excavation for the pumping plant intake would proceed. Relatively deep excavation would be required at the intake site. The excavation sideslopes would be shored using sheet piling. A dewatering system would be installed outside as necessary to maintain reduced groundwater levels in the construction area. These measures would ensure the stability of the excavation and allow construction to proceed in dry conditions. It is estimated that construction of the intake structure floors and walls would take 47 days. Installation of the pumping plant floor slabs also would occur during this period.

Following construction of the intake structure and pumping plant floor, construction of the pumping plant would continue, as would the installation of the pumping plant discharge lines. Each pair of pumping units would be connected via a manifold to a 9-foot-diameter discharge pipe. A flow measurement structure would be located midway between the pumping plant and the intake structure to allow monitoring of flow rates in each pipe.

Cumulatively, construction of the pumping plant, intake structure, and associated components (*e.g.*, trashracks, bulkhead gates, pumps and valves) would take about 200 days and would extend from April through September. Roads and a parking lot at the site would be constructed in mid-September. The construction of the pumping plant, intake structure, and pipeline would require a maximum construction crew of 24 people.

Construction of the intake structure on the DMC and the turnout on the California Aqueduct likely would require lowering the water surfaces of both canals. To minimize impacts on water deliveries, these drawdowns would be timed to occur during periods of lower demand and would be limited in duration.

Two discharge pipes would cross under the California Aqueduct O&M road and connect to the California Aqueduct turnout. Motor-operated slide gates would be mounted over each discharge pipe at this structure. Installation of the pipeline and associated structures would take about 46 days and would extend from July through August, using a maximum construction crew of 10 people.

Staging and stockpile areas would be located in flat areas along the Federal right-of-way on both sides of the DMC. Excavated material not reused in permanent construction would be disposed of in spoilbanks in the Federal and State right-of-way land between the two canals. The exact location of the new spoilbanks has not been determined, but they would be placed adjacent to the existing spoilbanks and canal embankments within 2,600 feet of their point of origin. They would not be placed where they would result in an effect on any sensitive resources such as wetlands. No material would be hauled or disposed of outside the right-of-way.

Construction of the pumping plant, intake structure, and pipeline would require backhoe and front-end loaders, excavators, dump trucks, a crane, vibratory compactor, vibratory pile hammer, concrete mixers, and boom and scissor lifts. A 10-ton flatbed truck and pickup trucks would deliver materials and equipment. Additional equipment to be used includes a roller, trailer-mounted diesel pump, air compressor, generator, and welder. Construction materials would include contractor offices and various support facilities; pipe, pumps, valves, and other permanent machinery and equipment; temporary equipment such as dewatering systems; and imported earth materials such as gravel and asphalt. Portable generators and air compressors would be used at the pumping plant until the structure is complete and permanent power is installed. A pre-engineered steel building would be constructed at the southeast end of the project site and would house the pumping plant units and motor control equipment.

A new access road would be constructed between the DMC and California Aqueduct, and a service yard would be constructed adjacent to the pumping plant. The inter-canal access road would be 16–20 feet wide and surfaced with gravel. Guardrails, drainage culverts, and suitable erosion control measures would be installed as necessary for safety and controlling surface runoff. Temporary access between the DMC and California Aqueduct on the southern end of the Intertie construction site would also be needed (see Figure 4 below).

A 9-foot-high chain link security fence with razor wire on top would be installed around the pumping plant and associated facilities. The exterior of the facilities would be lighted. The exterior of the switchyard and pumping station facilities would be lighted. Low-pressure sodium lamps would be used instead of high-pressure sodium or mercury lamps. Lights would be installed at the lowest allowable height (maximum 26 feet) and the lowest allowable wattage would be used (less than 2000 lumens [150 watts]). In addition, lights would be screened (by possibly using plantings) and directed away from the night sky to the highest degree possible, and the number of lights used would be minimized to the highest degree possible.

California Aqueduct Turnout Structure

Initial excavation for the California Aqueduct turnout would begin after construction at the pumping plant site is initiated. As with the DMC intake site, relatively deep excavations would be required at the California Aqueduct turnout site. The excavation sideslopes would be shored using sheet piling, and a dewatering system would be installed as necessary to maintain reduced groundwater levels in the construction area.

A prefabricated steel cofferdam would be trucked to the turnout site, and lifted and positioned with a crane at the California Aqueduct. Complete installation of the cofferdam would require about 10 days. The turnout cofferdam then would be sealed and dewatered prior to removal of the aqueduct lining. Further excavation for the turnout structure then would proceed. It is estimated that construction of the turnout would take 52 days. Trashracks, grating, slide gates, and bulkhead gates then would be installed over a period of approximately 7 days. Once the gates are installed and the canal lining repaired, the cofferdam would be removed. Installation of the turnout structure and associated components would extend from the end of April through mid-August for about 94 days, with a maximum construction crew of 12 people.

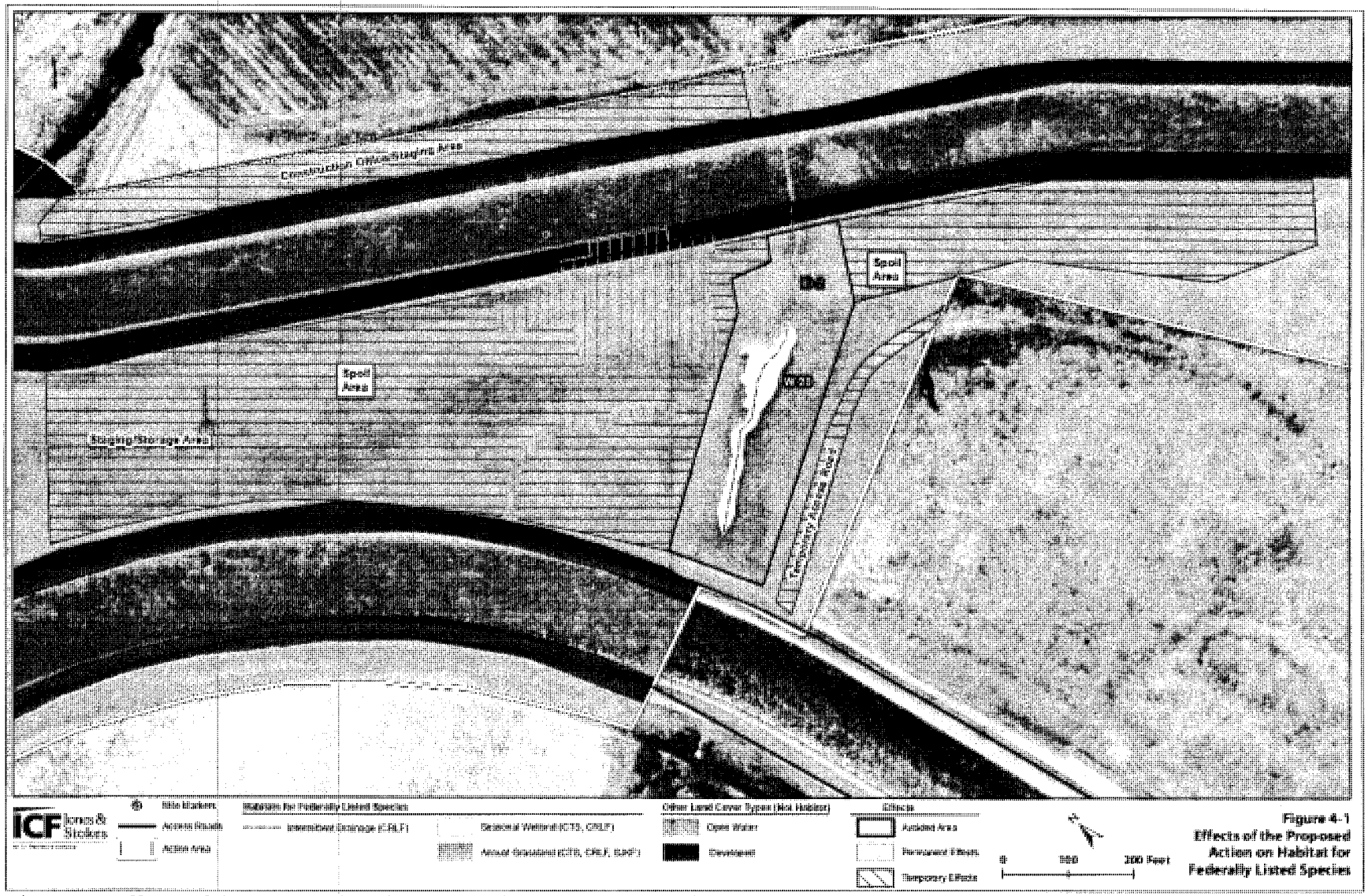

Figure 4. Effects of the Proposed Project on Habitat for Federally Listed Species (copied from Figure 4-1 in Reclamation 2009a).
Key: CTS = California tiger salamander, CRLF = California red-legged frog, SJKF = San Joaquin kit fox

Construction equipment would include a grader, excavator, dump truck, crane, vibratory compactor, air compressor, generator, loaders, and concrete mixers. Delivery vehicles, such as pickup trucks and a 10-ton flatbed truck, would deliver preassembled components such as the bulkhead and turnout gates and additional construction materials to the turnout site.

Switchyard

The new switchyard would be located adjacent to the pumping plant on the northwest side (Figure 1). Construction of the switchyard would begin with excavation and fill for the switchyard followed by excavation for the pull boxes. Gates and fencing for the switchyard would be constructed once excavation is completed. A 480-volt engine-generator would be installed as well as a fire detection and suppression system.

Construction of the switchyard and installation of associated electrical equipment would take an estimated 107 days and would extend from mid-July through October, with a maximum construction crew of 8 people. Construction equipment would include a forklift, excavator, vibratory compactor, roller, grader, crane, dozer, concrete mixer, loaders, and dump trucks. In addition, a water truck would be used to control dust.

Transmission Line

To supply the Intertie with power, a new overhead 69-kilovolt (kV) transmission line connecting to the Tracy substation would be constructed. The transmission line would run parallel to the DMC for about 4.5 miles and be built entirely on the west side of the canal. The line would be constructed using about 51 wood poles and 25 glue laminate poles, which would be placed in augered holes in the existing spoil piles left from the construction of the canal. The holes would be no more than 3 feet, 5 inches in diameter and about 14 feet in depth, supporting poles about 61 feet tall. Although span lengths will vary according to ground and alignment conditions, it is estimated that the average span length across straight segments of the transmission line would be about 300 feet.

Typically, following soil excavation/extraction, structure installation is done in three distinct steps: (1) vehicles traverse the transmission line right-of-way delivering materials at each structure site, such as poles, steel, hardware, etc; (2) once the materials are at each site, the structures are assembled prior to erection; and (3) the structures generally are erected with a large crane. The majority of the extracted dirt would be backfilled and compacted to support the poles. The remainder would be placed back onto the spoil piles. Wood poles would be further stabilized by guy wires anchored 50–60 feet from the pole's base. Conductor and optical ground wires would be strung on these poles. Transmission line installation would result in a permanent ground disturbance of about 3 to 13 square feet for each pole; the total permanent ground disturbance for the entire transmission line would be 0.005 to 0.02 acre. These estimates are based on a permanent ground disturbance diameter of 2 to 4 feet for each pole.

Four temporary staging and laydown areas would be required to store poles, construction equipment, and other construction-related material. These staging/laydown areas would be located near Kelso Road (40 x 500 feet), Mountain House Road (75 x 250 feet), Mountain House

Creek (50 x 400 feet), and Grant Line Road (60 x 120 feet) (Figures 2 and 3). In addition, three pulling and tensioning stations for stringing conductor would be located near Mountain House Road (50 x 300 feet), Grant Line Road (70 x 300 feet), and at the Intertie construction area (50 x 300 feet) (Figures 2 and 3). Two of these sites (Mountain House and Grant Line) would also be used for fiber pulling and tensioning).

Typical construction equipment would include a drill rig, grader, backhoe, loader, dozer, aerial lift truck, line trucks, pole and cable trucks, utility trucks, puller/tensioners, and a crane. Delivery vehicles such as flatbed trucks generally would be used to deliver preassembled and additional support structure components to each pole site. In addition, a water truck would be used to control dust. Construction of the transmission line would take about 40 work days and a crew of 12 workers. Construction of the transmission line would occur May through September.

Operations

Intertie

During startup, the pumping plant would be operated in manual and local automatic mode. Shortly after startup, installation of supervisory control and data acquisition (SCADA) equipment would allow the facility to operate in full automatic mode and would integrate data feedback to the Delta and CVP Operations Centers to facilitate overall system operations. Therefore, daily manned operation at (and travel to) the facilities would not be needed. Potential effects from operation of the Intertie in the Delta were addressed in the Operations Criteria and Plan (OCAP) Biological Opinion (Service 2008a, NMFS 2009). Therefore, operation of the Intertie is not discussed further.

Transmission Line Inspection and Maintenance

Periodic inspection activities may include ground and aerial patrols along the transmission line right-of-way. Inspections generally would involve visual evaluations of components such as conductors, transmission line support structures, and hardware. Routine minor maintenance within the transmission line right-of-way would include, but would not be limited to, the following activities:

- pole and guy wire–anchor maintenance;
- insulator maintenance;
- cross arms maintenance;
- vegetation clearance;
- vehicle and equipment staging; and
- conductor upgrade/maintenance.

Maintenance equipment may include, but would not be limited to, aerial lift trucks, line trucks, steel-tracked and/or rubber-tired bulldozers, graders, backhoes, and front-end loaders.

Schedule

Construction of the Intertie would be completed within about 12–15 months after award of the construction contract. Construction activity would occur 8–10 hours per day, 6 days per week. No work would occur at night.

Conservation Measures

Conservation Measure 1: Conduct Mandatory Biological Resources Awareness Training for All Project Personnel and Implement General Requirements

Before any ground disturbing work (including vegetation clearing and grading) occurs in the construction area, a Service-approved biologist will conduct mandatory biological resources awareness training for all construction personnel about the California red-legged frog and the California tiger salamander. The training will include the natural history, representative photographs, and legal status of the California red-legged frog and the California tiger salamander; terms and conditions of the Service's Biological Opinion; and the penalties for not complying with the terms and conditions. Proof of personnel attendance will be provided to the Service within one week of the training. If new construction personnel are added to the project, the contractor will ensure that the new personnel receive the mandatory training before starting work. The subsequent training of personnel can include videotape of the initial training and/or the use of written materials rather than in-person training by a biologist. Requirements that will be followed by construction personnel are listed below.

1. The contractor will clearly delineate the construction limits through the use of survey tape, pin flags, orange barrier fencing, or other means, and prohibit any construction-related traffic outside these boundaries.
2. Project-related vehicles will observe a 15-mile-per-hour speed limit on unpaved roads within the limits of construction.
3. Project-related vehicles and construction equipment will restrict off-road travel to the designated construction areas.
4. The contractor will provide closed garbage containers for the disposal of all food-related trash items (*e.g.*, wrappers, cans, bottles, food scraps). All garbage will be collected daily from the action area and placed in a closed container that will be emptied weekly at an approved offsite location. Construction personnel will not feed or otherwise attract fish or wildlife.
5. No pets will be allowed in the action area.
6. No firearms will be allowed in the action area.
7. If vehicle or equipment maintenance is necessary, it will be performed in the designated staging areas.
8. Any worker who inadvertently injures or kills a federally listed species or finds one dead, injured, or entrapped will immediately report the incident to the construction foreman or biological monitor. The construction foreman or monitor will immediately notify Reclamation, which will provide verbal notification to the Service's Endangered Species Division in Sacramento, California within one (1) working day of the incident. Reclamation will follow up with written notification to the Service within five (5) working days of the incident. The biological monitor will also independently notify the

Service of any unanticipated harm to any federally listed endangered species associated with the Proposed Project. All observations of federally listed species will be recorded on California Natural Diversity Data Base (CNDDB) field sheets and sent to CDFG by Reclamation or representative biological monitor.

Conservation Measure 2: Conduct Construction Activities during the Dry Season

All ground-disturbing activities will be conducted during the dry season, between May 1 and October 15, or before the onset of the rainy season, whichever occurs first unless exclusion fencing is used (see Conservation Measure 7 below).

Conservation Measure 3: Install Erosion Control Measures near Aquatic Habitat

Erosion control measures will be installed adjacent to suitable habitats for the California red-legged frog and the California tiger salamander to prevent soil or other materials from entering aquatic habitat. Erosion control features will be placed in areas that are upslope of or within 300 feet of suitable habitat to prevent any soil or other materials from entering aquatic habitat. The locations of erosion control features will be reviewed by a qualified biologist and identified on the final grading plans and construction specifications. Natural/biodegradable erosion control measures (i.e., coir rolls, straw wattles or hay bales) will be used. Plastic monofilament netting (erosion control matting) will not be allowed because California tiger salamanders and California red-legged frogs can become caught in this type of erosion control material. At intermittent drainage ID-2, erosion control measures would be installed at the tops of the slopes on the north and south sides of the drainage to prevent any soil from the Intertie construction site or along the temporary access road from entering the aquatic habitat.

Conservation Measure 4: Install Construction Barrier Fencing around Aquatic Habitats for Federally Listed Species

Reclamation or its contractor will install construction barrier fencing to protect habitat for the California tiger salamander and the California red-legged frog within and adjacent to all construction zones, including the transmission line installation area. The construction specifications will require that Reclamation or its contractor retain a qualified biologist to identify the areas that are to be avoided during construction. Areas adjacent to the directly affected area required for construction, including staging and access, will be fenced off to avoid disturbance in these areas. Before construction, the contractor will work with the qualified biologist to identify the locations for the barrier fencing and will place flags or flagging around the areas to be protected to indicate the locations of the barrier fences. The protected area will be clearly identified on the construction specifications. The fencing will be installed a minimum of 100 feet from the aquatic habitat areas and will be in place before construction activities are initiated. The fencing will be commercial-quality, woven polypropylene, orange in color, and at least 4 feet high (Tensor Polygrid or equivalent). The fencing will be tightly strung on posts with a maximum of 10-foot spacing. The fencing will be maintained throughout the duration of the construction period.

Conservation Measure 5: Locate Power Poles as Far from Aquatic Habitats for Federally Listed Species as Possible

To minimize effects on suitable aquatic habitats for the California red-legged frog and the California tiger salamander, poles associated with the transmission line will be installed as far from these habitats as possible.

Conservation Measure 6: Prepare and Implement a Construction Risk Management Plan

Because the Proposed Project would result in the disturbance of at least 1 acre, it would require coverage under the State Water Resources Control Board's National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges Associated with Construction Activity (General Construction Permit). Pursuant to the requisite NPDES General Construction Permit, a project Construction Risk Management Plan, which will include the typical information in a Hazardous Material Spill Prevention Control and Countermeasure Plan, will be prepared and implemented to establish procedures for transporting, handling, and storing hazardous materials used or encountered and for responding to inadvertent spills to minimize the potential for, and the effects of, spills of hazardous, toxic, or petroleum substances during construction that could affect habitat used by federally listed species. The plan will describe handling, transporting, and storage procedures for hazardous materials, including any existing contamination encountered in spoils or groundwater; construction site housekeeping practices and will identify the parties responsible for inspecting, spill response, and regulatory notifications, as applicable.

Conservation Measure 7: Install Temporary Exclusion Fencing if Work Continues into the Rainy Season

Construction that commences in the dry season may continue into the rainy season if exclusion fencing is placed around the construction areas, staging areas, and spoils stockpiling areas to keep California red-legged frogs and California tiger salamanders from entering these areas. Exclusion fencing should be installed by October 15. Reclamation will ensure that the exclusion fencing is continuously maintained until all construction activities are completed and that construction equipment is confined to the designated work areas. The exclusion fencing material will consist of 4-foot tall ¼ inch hardware cloth and if necessary, will be lined with silt fence as determined appropriate to site conditions. The lower portion of the fence will be buried to a depth of 4 inches. The fence will be secured to metal posts and wooden stakes to ensure that the hardware cloth fencing will remain upright and not fall over. Exclusion fencing will include one-way escape funnels to allow species to escape if they become trapped within the site despite the fencing. A Service-approved biological monitor will be on-site during installation of the fencing to relocate any listed species outside the construction area. The contractor and Reclamation will be responsible for inspecting the temporary exclusion fence daily during construction to ensure it is properly maintained. After construction has been completed, the exclusion fencing will be removed.

Conservation Measure 8: Conduct Preconstruction Surveys for California Tiger Salamander and California Red-Legged Frog

To avoid and minimize injury and mortality of California tiger salamanders and California red-legged frogs, Reclamation will retain a qualified wildlife biologist to conduct preconstruction clearance surveys no more than 24 hours before ground disturbance in upland habitat and conduct ongoing monitoring of construction in upland habitats. The biologist also will survey suitable adjacent aquatic habitat to determine whether California tiger salamanders or California red-legged frogs are in the vicinity of project activities.

In upland habitat, the biologist will search the construction area for burrows that provide suitable aestivation habitat. As feasible, aestivation areas identified within the construction area boundaries will be temporarily fenced and avoided. At locations where potential aestivation burrows are identified and cannot be avoided, the aestivation burrows will be examined with a burrow probe and if unoccupied, they will be excavated by hand prior to construction. If a burrow is occupied, the individual animal will be moved to a natural burrow or artificial burrow constructed of PVC pipe within 0.25 mile of the project area. Excavation and relocation will be conducted only by Service-approved biologists. The Service will be notified within three (3) working days of any California tiger salamander or California red-legged frog relocation.

Conservation Measure 9: Provide Escape Ramps or Cover Open Trenches at the End of Each Day to Avoid Entrapment of Listed Species

To avoid entrapment of listed species and thereby preventing injury or mortality of species resulting from falling into trenches, all excavated areas more than 1 foot deep will be provided with one or more escape ramps constructed of earth fill or wooden planks at the end of each workday. If escape ramps cannot be provided, then holes or trenches will be covered with plywood or other hard material. The biological monitor (see Conservation Measure 10) or construction personnel designated by the monitor will be responsible for thoroughly inspecting trenches for the presence of federally listed species at the beginning of each workday. If any individuals have become trapped, a Service-approved biologist will be contacted to relocate the animal and no work will occur in that area until approved by the biologist.

Conservation Measure 10: Monitor Initial Ground-Disturbing Activities and Vegetation Removal in Suitable Habitat for Federally Listed Species

A Service-approved biological monitor will remain on site during initial ground-disturbing activities (grading, excavation, and vegetation removal activities) at the Intertie construction area. During construction of the transmission line, the biological monitor will make periodic visits to the construction site to ensure that fences around aquatic habitats are in good working order, and that holes are not being left uncovered overnight. If work continues into the wet season, and exclusion fencing has been installed, the monitor will periodically check the fence to ensure that it does not have any tears or holes, the base of the fence is still buried, and that no individuals have been trapped in the fence.

Reclamation will designate the construction foreman or resident engineer as the point of contact in the event that a California tiger salamander or California red-legged frog is discovered on-site when the monitor is not present. If any of these species are found, construction activities will cease in the immediate vicinity of the individual and the Service-approved monitor will be contacted. Construction will not resume in that area until the animal moves on its own or has been removed (as authorized in the Biological Opinion) from the construction area by the biological monitor and released into suitable habitat (terrestrial, subterranean or aquatic) outside of the construction area and within 0.25 mile of where it was found. The Service will be notified within three (3) working days of any California tiger salamander or California red-legged frog relocation.

Once all initial ground-disturbing activities are completed, the biological monitor will perform spot checks of the site at least once a month for the duration of construction in order to ensure that construction barrier fences and exclusion fences (if installed) are in good order, trenches are being covered, project personnel are conducting checks beneath parked vehicles prior to their movement, and that all other required biological protection measures are being complied with. The biological monitor will document the results of monitoring on construction monitoring log sheets, which will be provided to the Service within one (1) week of each monitoring visit.

Conservation Measure 11: Restore Temporarily Affected Habitat for Federally Listed Species

Reclamation will restore temporarily disturbed annual grassland upon completion of construction activities (within one growing season). In addition, permanent spoils banks would be reseeded with a noninvasive native and naturalized grass and forb seed mix. Grassland restoration will be performed by the construction contractor according to the construction documents (i.e., plans and specifications). The construction documents will describe the process for restoration, which will include stockpiling the topsoil and replacing soil layers in the same order they were removed, restoring the grade, and reseeding with a noninvasive native and naturalized grass and forb seed mix. Restoring grassland in this manner will replace the habitat value that was temporarily lost as a result of construction activities.

Conservation Measure 12: Compensate for the Permanent Loss of Upland Habitat for California Tiger Salamander and California Red-Legged Frog

To compensate for the permanent loss of 1.2 acres of suitable upland habitat for the California tiger salamander and the California red-legged frog, Reclamation will purchase mitigation credits at a Service-approved mitigation or conservation bank at a 3:1 ratio (acres of habitat preserved to acres of habitat lost). The action area will be within the area of the mitigation or conservation bank where credits are purchased. Credits will be purchased prior to the start of any construction activities, including grading or clearing of vegetation. The mitigation/conservation area will be protected in perpetuity as upland habitat for the California tiger salamander and the California red-legged frog.

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." The action area for the Proposed Project is defined as the project construction area consisting of the Intertie, transmission line, and associated staging areas and access roads and a 200-foot buffer around these areas. This is the area in which the Proposed Project could result in direct or indirect effects on federally listed species. The indirect effects associated with operation of the intertie were addressed in the OCAP Biological Opinions (Service 2008a, NMFS 2009), and, therefore, are not discussed here.

Analytical Framework for the Jeopardy Analysis

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

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the California red-legged frog's and the California tiger salamander's current status, taking into account any cumulative effects, to determine if implementation of the Proposed Project is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the California red-legged frog and the California tiger salamander in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the California red-legged frog and the California tiger salamander and the role of the action area in the survival and recovery of the California red-legged frog and the California tiger salamander 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.

Status of the Species and Environmental Baseline

California Red-legged Frog

Status of the Species

The California red-legged frog was listed as a threatened species on May 23, 1996 (Service 1996). Critical Habitat was designated for this species on April 13, 2006 (Service 2006) and a proposed revision was published on September 16, 2008 (Service 2008b). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002).

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).

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).

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 1,500 meters 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 2.5 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 (60 meters) of aquatic habitat 90 percent 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 percent 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 percent 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 (Fellers 2005; Kupferberg 1996a, 1996b, 1997). 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).

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, Barry 1992, 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). Furthermore, 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; 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.

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.

Environmental Baseline

The action area is located within the Sierra Nevada Foothills and Central Valley Recovery Unit for the California red-legged frog and just outside the western edge of the East San Francisco

Bay Core Area (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 (Service 2002). The recovery status for the Sierra Nevada Foothills and Central Valley Recovery Unit is considered low due to few existing populations, high levels of threats and, in general, medium habitat suitability (Service 2002).

Breeding and nonbreeding aquatic habitat and upland dispersal habitat for the California red-legged frog are present in the action area. Suitable breeding habitat is present in perennial drainage PD-1 and Mountain House Creek (PD-2) (Figures 5A and 5B below). PD-1 had one small pooled area near the canal access road that provides suitable breeding habitat for California red-legged frog; however numerous fish were observed in this drainage. Mountain House Creek contains pooled areas and emergent vegetation, but may also contain fish. The two intermittent drainages (ID-1 and ID-2) and perennial drainage PD-3 provide suitable nonbreeding (foraging, cover, and dispersal) habitat for California red-legged frog. These creeks are either narrow and do not have deeper pooled areas or do not hold water long enough to provide breeding habitat. California red-legged frogs could also occur occasionally at the two smaller dirt-bottomed irrigation canals near the northern end of the action area, but these do not provide suitable breeding habitat (Figure 5B). Outside of the action area, but near it, are a large ponded area that is part of Mountain House Creek and a stock pond north of this ponded area that likely provide suitable breeding habitat for California red-legged frog. Annual and alkali grasslands within the action area are considered suitable upland (dispersal or aestivation) habitat for California red-legged frog. Access by frogs to the portion of the action area located between the DMC and California Aqueduct is limited to drainages that cross under the canals, roadway crossings, and portions of the canal that are underground. However, as described below, California red-legged frogs have been observed in this area.

Two adult California red-legged frogs were observed in the action area at PD-1 during the July 2009 site visit (Figure 5B). In addition, there are two CNDDB records for observations of California red-legged frog in the action area. The first record is for an adult red-legged frog that was observed in intermittent drainage ID-2 (Figures 4 and 5A) between the DMC and California Aqueduct in 2003 (CNDDB 2009). The second record is for an occurrence of a breeding population of California red-legged frog that was found in 2002 in Mountain House Creek at the California Aqueduct (Figure 5A). The CNDDB lists 63 additional records within 5 miles of the action area (CNDDB 2009). Therefore, the Service has determined it is reasonable to conclude the California red-legged frog inhabits the action area, based on the biology and ecology of the species, the recent nearby records, and the presence of suitable habitat in the action area.

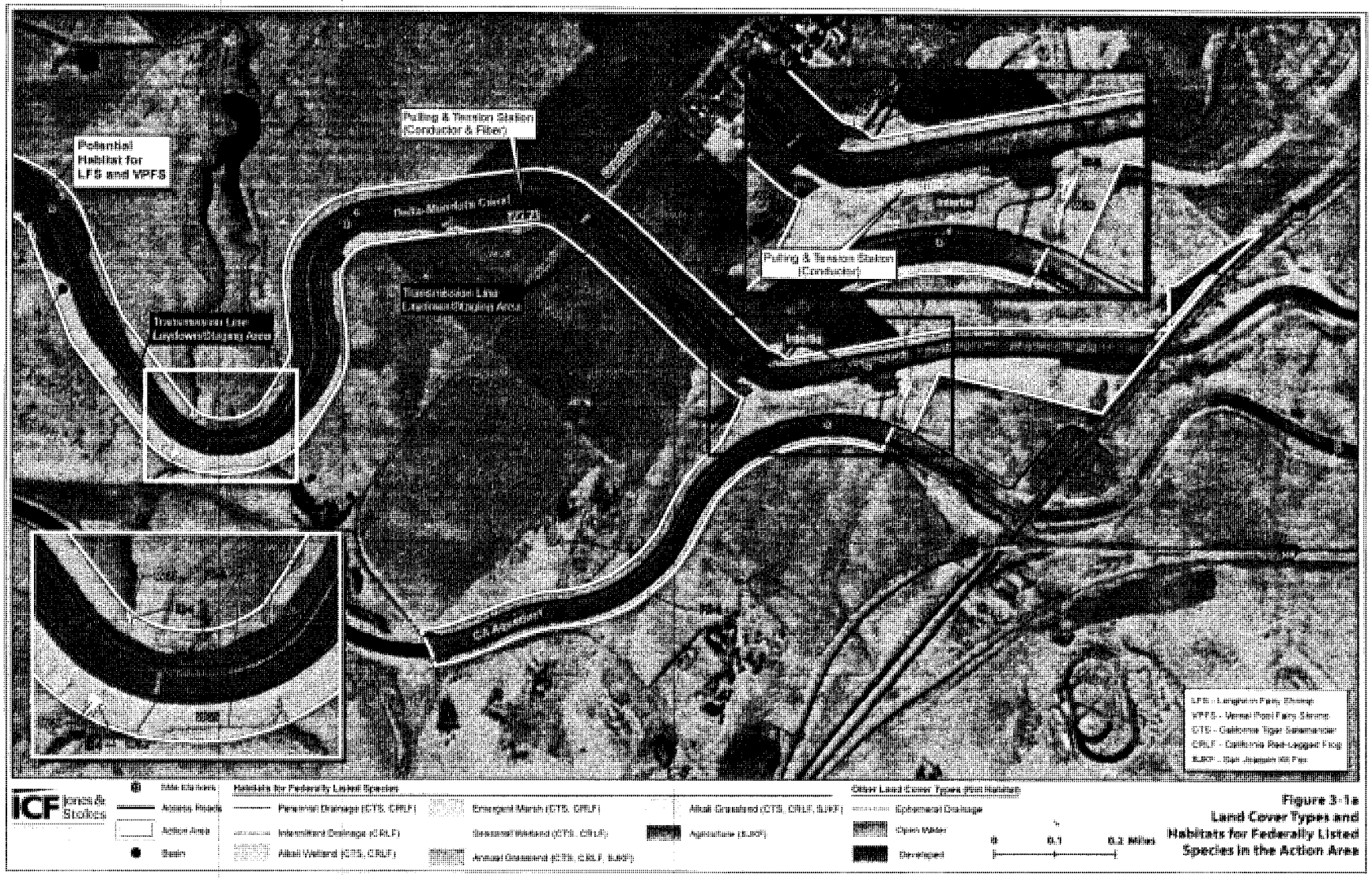

Figure 5A. Land Cover Types and Habitats for Federally Listed Species in the Southern Portion of the Action Area (copied from Figure 3-1a in Reclamation 2009a). Key: CTS = California tiger salamander, CRLF = California red-legged frog, SJKF = San Joaquin kit fox, LFS = longhorn fairy shrimp, VPFS = vernal pool fairy shrimp

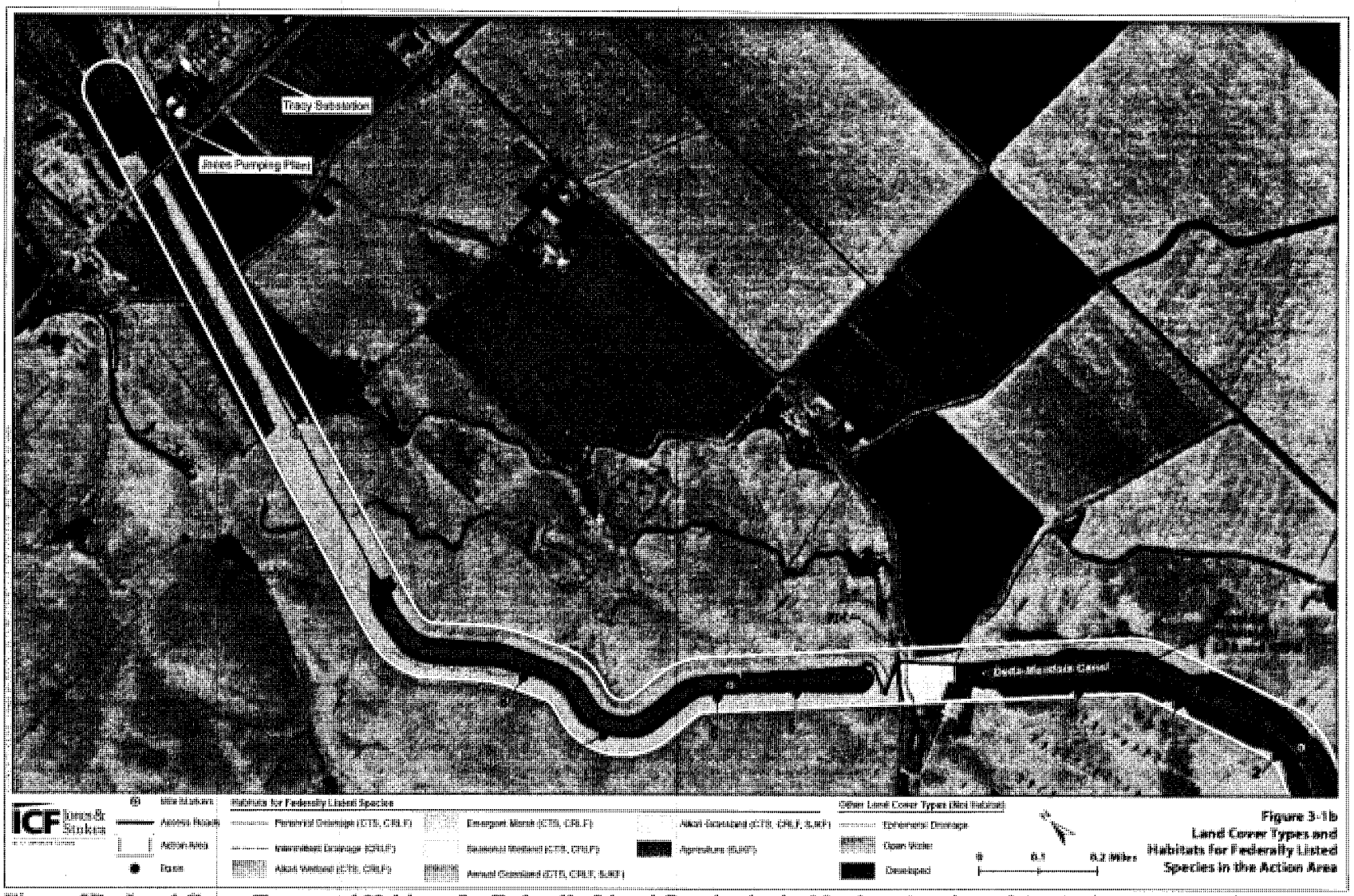

Figure 5B. Land Cover Types and Habitats for Federally Listed Species in the Northern Portion of the Action Area (copied from Figure 3-1b in Reclamation 2009a). Key: CTS = California tiger salamander, CRLF = California red-legged frog, SJKF = San Joaquin kit fox, LFS = longhorn fairy shrimp, VPFS = vernal pool fairy shrimp

California Tiger Salamander

Status of the Species

The final rule listing the Central Valley population of the California tiger salamander as a threatened species was published on August 4, 2004 (Service 2004). Critical habitat was designated on August 23, 2005 in 19 counties for the Central Valley population (Service 2005a).

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.

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.

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 average 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 (Pechmann *et al.* 1989; Semlitsch *et al.* 1988; Morey 1998; Trenham 1998b). Larvae will perish if a breeding pond dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1989) 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 sited 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 cited 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.

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 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 percent by 2025 (California Department of Transportation 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 cannot 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 Apeldoorn 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 (Hilty and Merenlender 2004; Petit *et al.* 1995; Buza *et al.* 2000).

Thirty-one percent (221 of 711 records and occurrences) of all Central Valley DPS 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 2003; CDFG 2009; Service 2004). CDFG (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 *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

Suitable breeding habitat and upland dispersal habitat for California tiger salamander are present in the action area. Suitable breeding habitat is present in perennial drainage PD-1 and Mountain House Creek (PD-2) (Figures 5A – 5B above). PD-1 had one small pooled area near the canal access road that provides suitable breeding habitat for California tiger salamander; however numerous fish were observed in this drainage (Figure 5A). Mountain House Creek (Figure 5A) contains pooled areas and emergent vegetation, but may also contain fish. The presence of fish in these drainages would decrease the suitability of habitat for California tiger salamander. Seasonal wetland areas associated with intermittent drainage ID-1 and emergent marsh W-24 (Figure 5A) may provide suitable breeding habitat for California tiger salamander if they maintain water long enough for metamorphosis to occur. The eight small basins at the north end of the action area (Figure 5B) likely do not hold water long enough for California tiger salamander breeding because they are relatively small (4 feet by 5 feet to 15 feet by 30 feet) and shallow (6-12 inches). Outside of the action area, but near it, Mountain House Creek (including a large ponded area in the creek) and a stock pond north of the creek and northeast of the DMC (Figure 5A) likely provide suitable breeding habitat for California tiger salamander. Annual and alkali grasslands within the action area are considered suitable upland (dispersal or aestivation) habitat for California tiger salamander. Access by salamanders to the portion of the action area located between the DMC and California Aqueduct is limited to drainages that cross under the canals, roadway crossings, and portions of the canal that are underground. Because the area between the canals has limited accessibility, the potential for California tiger salamanders to occur in this area is decreased.

There are no CNDDB (2009) records for California tiger salamander in the action area. There are three records for occurrences within 1.24 miles of the action area, the closest being an occurrence immediately west of the California Aqueduct and Midway Road in Altamont Creek (CNDDB 2009). These three records were from 1999, 2003, and 2008. The CNDDB lists 45 additional records for California tiger salamander within 5 miles of the action area. The Service has determined that it is reasonable to conclude the California tiger salamander inhabits the action area, based on the documented ability of the animal to disperse at least 1.3 miles, the

recent records within 1.25 miles of the action area, the biology and ecology of the species, and the presence of suitable habitat within the action area.

Effects of the Proposed Project

Direct Effects

Temporary Disturbance or Degradation of Suitable Aquatic Habitat for California Tiger Salamander and California Red-Legged Frog

The proposed Intertie construction area, staging areas, spoils areas, and access routes surround intermittent drainage ID-2 (Figure 4). In addition, intermittent drainage PD-3 is located within 2,600 feet of the Intertie construction area (the distance within which permanent spoilsbanks could be located) (Figure 5A). Activities at the Intertie construction area or placement of spoilsbanks could result in erosion or sedimentation from disturbed surfaces and result in degradation of suitable aquatic habitat. Because construction activities would occur only during the dry season (Conservation Measure 2) and erosion control measures (Conservation Measure 3) would be implemented, effects on ID-2 and PD-3 would be minimized or avoided.

The three perennial drainages (PD-1, PD-2, and PD-3), intermittent drainage ID-1, and emergent marsh W-24 could be affected by construction of the transmission line (Figures 5A and 5B). Staging and stockpiling of transmission line equipment and supplies could temporarily disturb aquatic habitat for California tiger salamander and California red-legged frog. Augering holes for pole installation, assembling and erecting of structures, and backfilling of pole holes could result in disturbance or degradation of the aquatic habitat if soil or other materials are sidecast or fall into the habitats. Effects from staging of equipment and construction of the transmission line would be avoided by fencing the aquatic habitats to avoid encroachment into them and locating poles as far from aquatic habitats as possible (Conservation Measures 4 and 5).

Fuel or oil leaks or spills adjacent to aquatic habitat could also cause degradation of habitat. A construction risk management plan would be implemented to prevent and control contamination (Conservation Measure 6).

The following conservation measures have been incorporated into the Proposed Project to avoid and minimize direct effects on California tiger salamander and California red-legged frog aquatic habitat:

- Conservation Measure 1: Conduct Mandatory Biological Resources Awareness Training for All Project Personnel and Implement General Requirements
- Conservation Measure 2: Conduct Construction Activities during the Dry Season
- Conservation Measure 3: Install Erosion Control Measures near Aquatic Habitat
- Conservation Measure 4: Install Construction Barrier Fencing around Aquatic Habitats for Federally Listed Species
- Conservation Measure 5: Locate Power Poles, Staging Areas, and Spoils Storage Areas as Far from Aquatic Habitats for Federally Listed Species as Possible.
- Conservation Measure 6: Prepare and Implement a Construction Risk Management Plan

Permanent Loss and Temporary Disturbance of Suitable Upland Habitat for California Tiger Salamander and California Red-Legged Frog

About 1.2 acres of upland habitat for California tiger salamander and California red-legged frog would be permanently removed from construction of the Intertie and from the pole footprints along the transmission line. About 10.3 acres of upland habitat would be temporarily removed from activities associated with construction of the Intertie (staging areas, temporary soil stockpiling areas, the temporary access route at the Intertie, permanent spoils banks, and installation of pipelines), and 2.7 acres of upland habitat would be temporarily removed from activities associated with the transmission line (laydown/staging areas and pulling/tension stations). The permanent loss of 1.2 acres of suitable upland habitat for California tiger salamander and California red-legged frog will be compensated for by purchasing mitigation credits at a Service approved mitigation/conservation bank at a 3:1 ratio (acres of habitat preserved to acres of habitat lost) (Conservation Measure 12). Grassland areas that are temporarily disturbed would be restored to pre-project or better conditions within one growing season (Conservation Measure 11). Permanent spoils banks would be reseeded with a noninvasive native and naturalized grass and forb seed mix. No compensation is proposed for the temporary loss of suitable upland habitat.

The following conservation measures have been incorporated into the Proposed Project to compensate for the permanent loss of upland habitat and minimize temporary disturbance of upland habitat for California tiger salamander and California red-legged frog:

- Conservation Measure 11: Restore Temporarily Affected Habitat for Federally Listed Species
- Conservation Measure 12: Compensate for the Permanent Loss of Upland Habitat for California Tiger Salamander and California Red-Legged Frog

Potential Injury or Mortality of California Tiger Salamanders and California Red-Legged Frogs

Potential injury or mortality of California tiger salamanders and California red-legged frogs could occur if soil or other materials are sidecast or fall into nearby aquatic habitat. Fuel or oil spills from construction equipment into aquatic habitat could also cause mortality of salamanders and frogs. These potential effects would be avoided through environmental education (Conservation Measure 1); conducting work during the dry season (Conservation Measure 2); locating power poles, staging areas, and spoils sites away from aquatic habitat (Conservation Measure 5); and installation of fencing around aquatic habitats (Conservation Measure 4).

Mortality or injury of California tiger salamanders and California red-legged frogs in upland habitat could occur if burrows containing salamanders or frogs are crushed by construction equipment or if salamanders or frogs are displaced from burrows, exposing them to predators and desiccation. Trenches left open during the night could trap salamanders or frogs moving through the construction area. Salamanders and frogs could be injured or killed while moving to aquatic habitats to breed and dispersing from aquatic habitats to upland habitat. Noise and vibrations from construction equipment, and presence of human activity during construction activities may also disturb California tiger salamanders and California red-legged frogs within the action area. These potential effects would be minimized or avoided by conducting work

during the dry season (Conservation Measure 2), conducting preconstruction surveys (Conservation Measure 8), providing escape routes or covering open trenches (Conservation Measure 9), and monitoring ground disturbing activities (Conservation Measure 10). If work continues into the wet season at the Intertie construction area, exclusion fencing would be installed around the construction area to prevent California tiger salamanders and California red-legged frogs from entering the construction area (Conservation Measure 7).

The following conservation measures have been incorporated into the Proposed Project to avoid and minimize the chance of injury or mortality of California tiger salamanders and California red-legged frogs:

- Conservation Measure 1: Conduct Mandatory Biological Resources Awareness Training for All Project Personnel and Implement General Requirements
- Conservation Measure 2: Conduct Construction Activities during the Dry Season
- Conservation Measure 4: Install Construction Barrier Fencing around Aquatic Habitats for Federally Listed Species
- Conservation Measure 5: Locate Power Poles, Staging Areas, and Spoils Storage Areas as Far from Aquatic Habitats for Federally Listed Species as Possible
- Conservation Measure 7: Install Temporary Exclusion Fencing if Work Continues into the Rainy Season
- Conservation Measure 8: Conduct Preconstruction Surveys for California Tiger Salamander and California Red-Legged Frog
- Conservation Measure 9: Provide Escape Ramps or Cover Open Trenches at the End of Each Day to Avoid Entrapment of Listed Species
- Conservation Measure 10: Monitor Initial Ground-Disturbing Activities and Vegetation Removal in Suitable Habitat for Federally Listed Species

Indirect Effects

The Proposed Project has the potential to result in one indirect effect on California tiger salamander and California red-legged frog and is described below. Several other indirect effects on California tiger salamander and California red-legged frog and their habitats were considered but were determined to have no potential to occur as a result of the Proposed Project. Specifically, it was determined:

- There would be no increase of trash, hazardous waste, or off-road vehicle use due to increased human presence. The Proposed Project would not result in development or increased access to California tiger salamander and California red-legged frog habitat (access roads along the DMC and California Aqueduct are gated and will remain so).
- There would be no increased use of herbicides and/or pesticides as a result of the Proposed Project. The Authority has developed and implemented an Integrated Pest Management Plan for the entire DMC. Several herbicides (Roundup, Direx4L/Karmex XP, Predict, and Vanquish) and pesticides (Tempo [for black widows], Cholorphalione and Diphacione [for ground squirrels], and over the counter products [for wasps and hornets]) are currently used to control a variety of plants, specific insects, and ground squirrels along the DMC under this plan. There would be no herbicide or pesticide use plan specific to the action area. It is assumed that the use of these herbicides and pesticides would continue, and the amounts used would not change.

- The Proposed Project would not result in indirect effects from introduction of exotic predators, such as bullfrogs and mosquito fish, because the Proposed Project would not create new habitat for exotic predators, connect habitat containing exotic predators, change the length of inundation, or result in any other habitat modifications that would make the habitat more favorable for exotic predators. Although a small amount (0.3 acre) of new impermeable surface (from the pump station and switchyard) would be present upon completion of the Intertie, and could result in a higher level of surface runoff into intermittent drainage ID-2, it is expected that this change would be minimal and would not substantially change the duration of flow in the drainage.
- The Proposed Project is unlikely to result in an increase in potential mortality of California tiger salamander and California red-legged frog due to an increase in vehicles traveling along the canal access roads to conduct maintenance activities. Although there would be no increase in the number of vehicles from operation of the new facilities because they would be operated remotely from the Delta and CVP Operations Centers, there would be an increase in the number of vehicles traveling on the canal access roads because maintenance of the transmission line, pumping plant, and other facilities would increase from current levels of maintenance. Currently, there are five maintenance activities that are conducted annually (see Table 1). After construction of the Proposed Project, there would be 21 additional maintenance activities that would occur at varying frequencies from monthly to annually (see Table 2). An increase in vehicles traveling along the access roads, especially in the early morning or evening or during rain events could increase the potential for mortality of salamanders or frogs that are crossing the roadway. Because the action area is located between the California Aqueduct and DMC, which are barriers to overland dispersal, it is expected that most frogs and salamanders would move along existing drainages that flow under the canals. In addition, the nature of the roadway (gravel) would necessitate slow speeds, and maintenance activities would occur during the daytime hours, which would decrease the potential for mortality since these species are less active during this time period (unless it is raining or it is cool with high humidity). With these conditions in place, it is unlikely that the increase in maintenance vehicles traveling along the canal access roads would result in increased mortality of California tiger salamander and California red-legged frog.

Table 1. Current Maintenance Activities along the Delta-Mendota Canal in the Action Area (copied from Table 4-2 in Reclamation 2009a).

Maintenance Activity	Frequency	Number of Personnel	Type of Vehicles Required
Road maintenance	Annually	2	¾ ton pickup, motor grader & transport tractor-trailer
Fence repair	Annually	2	¾ ton pickup
Weed control (chemical)	Annually	1	1 ton spray truck
Weed control (mechanical)	Annually	1	tractor w/disc
Erosion control/repair	Annually	2	¾ ton pickup, loader/backhoe

Table 2. Proposed Maintenance Activities along the Delta-Mendota Canal in the Action Area after Construction of the Proposed Project (copied from Table 4-3 in Reclamation 2009a).

Maintenance Activity	Frequency	Number of Personnel	Typical Vehicle Required
Trashrack cleaning	Monthly	2	¾ ton pickup
Road maintenance	Annually	2	¾ ton pickup, motor grader & transport tractor-trailer
Sump cleaning	Semi-annually	2	¾ ton pickup, dump truck, portable air compressor
Fence repair	Annually	2	¾ ton pickup
Weed control (mechanical)	Quarterly	1	tractor w/disc
Weed control (chemical)	Quarterly	1	1 ton spray truck
Building maintenance	Annually	2	¾ ton pickup
Erosion control/repair	Annually	2	¾ ton pickup, loader/backhoe
Pest Control	Quarterly	1	¾ ton pickup
Penstock maintenance and inspection	Annually	3	¾ ton pickup & 1 ton service truck
Intake structure maintenance and inspection	Annually	3	¾ ton pickup & 1 ton service truck
Motor maintenance (2/YR)	Annually	2	1 ton service truck
Pump maintenance (2/YR)	Annually	2	1 ton service truck
Switchgear maintenance	Annually	2	1 ton service truck
Breaker maintenance	Annually	2	1 ton service truck
Relay maintenance	Bi-annually	2	1 ton service truck
Facility lighting maintenance	Quarterly	2	1 ton service truck, manlift
Facility AC & ventilation system maintenance	Quarterly	1	¾ ton pickup
Valve maintenance (6/YR)	Annually	2	1 ton service truck
Gate maintenance (2/YR)	Annually	2	1 ton service truck
Transformer maintenance	Annually	2	1 ton service truck
Annunciator/alarm maintenance	Quarterly	1	¾ ton pickup
Generator maintenance	Monthly	1	¾ ton pickup
SCADA general maintenance & programming	Monthly	1	¾ ton pickup
Meter testing & maintenance/calibration	Monthly	2	¾ ton pickup
Transmission line maintenance (by contract)	Annually	3	2 ton service truck with manbucket

Potential Disturbance of California Tiger Salamander and California Red-Legged Frog by Artificial Lighting

As discussed in the description of the Proposed Project, the exterior of the Intertie facilities would be lighted. Lighting in an area that was not previously illuminated at night could affect animals that are active at night (such as California tiger salamander and California red-legged

frog) by disrupting nocturnal foraging or breeding activities. Lighting may also make California tiger salamanders and California red-legged frogs more susceptible to predation because the light would make them more visible to predators. The effects of lighting on California tiger salamander and California red-legged frog will be minimized through the following specifications, which are part of the Proposed Project.

- Low-pressure sodium lamps would be used instead of instead of high-pressure sodium or mercury lamps;
- Lights will be installed at the lowest allowable height (maximum 26 feet);
- The lowest allowable wattage will be used (less than 2000 lumens [150 watts]);
- Lights will be screened (by possibly using plantings) and directed away from the night sky to the highest degree possible; and
- The number of outside lights will be minimized to the highest degree possible.

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. No other actions within the action area are proposed at this time. Future Federal actions that are unrelated to the Proposed Project are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The global average temperature has risen by approximately 0.6 degree centigrade during the 20th Century (International Panel on Climate Change 2001, 2007a, 2007b; 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, 2007a, 2007b; 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, 20 to 30 percent of plant and animal species will face an increasingly high risk of extinction (International Panel on Climate Change 2001, 2007a, 2007b). 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, 2007a, 2007b; 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 California red-legged frog and the California tiger salamander 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 and the California tiger salamander, the environmental baseline for the action area, the effects of the proposed Delta-Mendota Canal/California Aqueduct Intertie Project and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is likely to adversely affect both species, but is not likely to jeopardize their continued existence.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, respectively, 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 incidental to and not intended as part of the agency project 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 nondiscretionary for listed species in this opinion and must be implemented by Reclamation in order for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, 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 for the following reasons: their relatively small body size make the finding of a dead specimen unlikely; the cryptic nature of the species; losses may be masked by seasonal fluctuations in numbers or other causes; and the species occurs in aquatic, riparian and upland habitats that makes it difficult to detect. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the Proposed Project, the Service is quantifying take incidental to the Proposed Project as all California red-legged frogs inhabiting or utilizing the 1.2 acres of suitable upland habitat identified in the Biological Assessment. The Service anticipates that take of egg, larval, juvenile, and adult life history stages may be in the form of harm, capture, injury, harassment, or mortality resulting from habitat loss/degradation, construction-related disturbance, or capture and relocation. Upon implementation of the following Reasonable and Prudent Measures, all eggs, larvae, juvenile, subadult or adult California red-legged frogs within the action area will become exempt from the prohibitions described under section 9 of the Act resulting from the Proposed Project. 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 because when this amphibian is not in its breeding ponds, foraging, migrating, or conducting other surface activity, it inhabits fossorial mammal burrows and other underground refugia; upland refugia may be located a distance from the breeding ponds; the migrations occur on a limited period during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of its relatively small body size and cryptic nature. Losses of this species may also be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in the water regime at their breeding ponds, or additional environmental disturbances. Due to the difficulty in quantifying the number of California tiger salamanders that will be taken as a result of the Proposed Project, the Service is quantifying take incidental to the Proposed Project as all California tiger salamanders inhabiting or utilizing the 1.2 acres of suitable upland habitat identified in the Biological Assessment. The Service anticipates that take of juvenile or adult California tiger salamanders may be in the form of harm, harassment, capture, injury, or mortality resulting from habitat loss/degradation, construction-related disturbance, or capture and relocation. Upon implementation of the following Reasonable and Prudent Measures, all juvenile or adult California tiger salamanders within the action area will become exempt from the prohibitions described under section 9 of the Act resulting from the Proposed Project. 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 to the California red-legged frog and the California tiger salamander, 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 Project on the California red-legged frog and the California tiger salamander:

1. Reclamation shall implement the conservation measures in the project description of the September 2009 Biological Assessment (Reclamation 2009a), the September 15, 2009 letter to the Service, and this biological opinion to minimize take of the California red-legged frog and the California tiger salamander.

2. Reclamation shall ensure adverse effects to the California red-legged frog and the California tiger salamander will be minimized.

3. Reclamation shall ensure their compliance with this biological opinion.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Reclamation 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. Reclamation 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, Reclamation shall educate and inform contractors involved in the project as to the requirements of the biological opinion.

    b. As described in the Conservation Measures of this biological opinion, to reduce the overall level of take of California red-legged frog and California tiger salamander, Reclamation shall compensate for the 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. Reclamation shall 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 assists in the recovery of the species by facilitating the (re)colonization of suitable, unoccupied habitat from source populations. Reclamation shall compensate for the permanent loss of 2.1 acres of upland habitat for the California red-legged frog and California tiger salamander by purchasing mitigation credits at a Service-approved mitigation or conservation bank at a 3:1 ratio (acres of habitat preserved to acres of habitat lost). Prior to or by the start of construction, Reclamation shall purchase 6.3 conservation bank credits at a Service-approved conservation bank whose service area encompasses the action area for the two species. Conservation credits shall be purchased and documentation provided to the Service/CDFG 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. The conservation area will be protected in perpetuity as upland habitat for the California tiger salamander and the California red-legged frog.

2. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):
   a. 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 Project. 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 the date of initial 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.

   b. The Service-approved biologist(s) shall be onsite during all activities that may result in the take of California red-legged frog and the California tiger salamander. 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 the date of initial 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 Reclamation 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.

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

   d. If California red-legged frogs or California tiger salamanders are encountered in the action area, work within the immediate vicinity should cease immediately and the Resident Engineer and Service-approved biologist shall be notified. Based on the professional judgment of the Service-approved biologist, if project activities

can be conducted without harming or injuring the California red-legged frog(s) or California tiger salamander(s), the individual(s) shall be left at the location of discovery and monitored by the Service-approved biologist. All project personnel shall be notified of the finding and at no time shall work occur within the vicinity of the listed species 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 shall be followed:

i. Prior to handling and relocation, the Service-approved biologist shall 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 2005b) 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.

ii. California red-legged frogs and California tiger salamanders shall 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 shall be minimized to the maximum extent practicable. Holding/transporting containers and dipnets shall be thoroughly cleaned and disinfected prior to transporting to the action area and shall 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.

iii. California red-legged frogs and California tiger salamanders shall 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 the DMC or California Aqueduct where it was discovered. If salamanders are captured from burrows, they shall be relocated to the nearest active burrow network outside of the work zone. The release burrow(s) shall be actively occupied by ground squirrels, since inactive burrows can collapse if not maintained. No more than two juvenile or adult salamanders shall be released into the same burrow. Transporting California red-legged frogs and California tiger salamanders to a location other than the location described herein shall require written authorization of the Service.

3. The following Terms and Conditions implement Reasonable and Prudent Measure three (3):
   a. If verbally requested, before, during, or upon completion of ground breaking and construction activities, Reclamation 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 and California tiger salamander and their habitat.

b. The following shall be implemented for all staging, storage, lay down, vehicle access, and parking areas associated with the project:

   i. Contractors may independently seek off-site staging locations. Offsite staging locations shall be subject to the requirements of resource agencies and permits will be the responsibility of the contractor.

   ii. Reclamation 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.

c. The Service-approved biologist shall maintain written 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, 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 or CDFG upon verbal or written request. Originals of all monitoring records shall be provided to the Service immediately upon completion of the monitoring work.

Reporting Requirements

Proof of environmental training and fulfillment of compensation requirements shall be provided to 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 and California tiger salamander, 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 and California tiger salamander must be cared for by a licensed veterinarian or other qualified person, such as the on-site biologist. Dead individuals of any listed species shall be placed in a Zip-lock® bag containing a piece of paper with the date, time and location where the specimen was found, the name of the person who found it in permanent ink, and then placed in a freezer in a secure location. The Service and CDFG 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 must include the date, time, and location of the incident or of the 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.

Reclamation 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 and California tiger salamander, if any; (v) occurrences of incidental take of California red-legged frog and California tiger salamander, if any; (vi) documentation of employee environmental education; and (vii) other pertinent information. The report 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.

Reclamation shall report to the Service any information about take or suspected take of listed wildlife species not authorized by this biological opinion. Reclamation 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 appropriate, 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

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

1. Reclamation and WAPA should incorporate the avoidance and minimization measures identified for migratory birds in the March 2009 Administrative Draft Environmental Impact Statement for the Proposed Project (Reclamation 2009b).
2. Reclamation and WAPA should comply with Executive Order 13186 by ensuring "that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources" (66 FR 3853). Reclamation and WAPA should follow the recommendations in the bird conservation

plans developed by California Partners in Flight, Central Valley Joint Venture, and Riparian Habitat Joint Venture for restoring and managing wetland, riparian, grassland, oak woodland, chaparral, and coniferous forest habitats for migratory birds (*e.g.*, Central Valley Joint Venture 2006; Riparian Habitat Joint Venture 2004; River Partners and Riparian Habitat Joint Venture 2009; California Partners in Flight 2000, 2002a, 2002b, 2004). Reclamation and WAPA should also develop a Memorandum of Understanding with the Service for the protection of migratory birds as required by Executive Order 13186.

3. Reclamation and WAPA should minimize the impacts of light pollution on migratory birds and bats by following the measures proposed in the September 2009 Biological Assessment for the Proposed Project (Reclamation 2009a), Fure (2006), and below: limit the times during which the lighting can be used to provide some dark periods; avoid illuminating bat roosting areas (e.g., suitable crevices in overcrossings along canals); enhance bat roosting habitat by installing bat boxes away from artificial light sources.
4. Reclamation and WAPA should minimize the impacts of the proposed 4.5-mile long 69-kV transmission line on migratory birds and bats by placing the transmission line underground. If this is not feasible or would result in significant impacts to federally- or State-listed species (ESA or CESA), then follow the recommendations and suggested practices in the power line guidelines published by the Avian Power Line Interaction Committee (APLIC) and the Service to minimize impacts from existing facilities and in the construction of new utility and energy systems and associated infrastructure (APLIC 1994, 1996, and 2006; APLIC and Service 2005).
    a. Develop an Avian Protection Plan that minimizes the risk of electrocution, collision, and nest disturbance for migratory birds (APLIC and Service 2005).
    b. Use a horizontal and vertical separation between energized and/or grounded parts that allows sufficient clearance for wrist-to-wrist (flesh-to-flesh) and head-to-foot (flesh-to-flesh) clearance for the largest migratory birds in the project area. The standard 60 inches of horizontal separation and 40-48 inches of vertical separation between energized and/or grounded parts are generally recommended for eagles but may not be sufficient for wading birds, white pelicans, and California condors, which have a larger height and greater wingspan (APLIC 2006). In particular areas (*i.e.,* areas with concentrations of wading birds and pelicans), vertical separation may need to be increased to 65 inches, and horizontal separation may need to be increased to 120 inches (APLIC 2006).
    c. Cover exposed grounded or energized parts to prevent avian contact.
    d. Minimize the risk of collision by removing the overhead ground wire, or marking the line to increase visibility (e.g., marker balls, swinger markers, or bird flight diverters).
    e. Monitor and report to the Service and CDFG any bird mortalities associated with the transmission line. Retrofit or modify power poles where a protected bird has died. Modifications should be in accordance with APLIC guidelines.
    f. Inventory and monitor bird populations and habitats, as appropriate and feasible, to facilitate decisions about the need for, and effectiveness of, conservation efforts.
    g. The Avian Protection Plan should also include measures to minimize the negative effects of increasing artificial perches for raptors in areas containing sensitive

prey species (*e.g.*, California red-legged frog, California tiger salamander, western spadefoot toad, coast horned lizard, and western burrowing owl). Monitor the effects of increasing artificial perches for raptors on sensitive prey populations in the area and the effectiveness of measures to prevent increased predation.

h. Avoid disturbing sensitive habitats (e.g., wetlands) during construction and operation and maintenance within the transmission line right-of-way.

i. Compensate for the impacts of the transmission line on migratory birds and bats by collaborating with the California Public Utility Commission and funding the retrofitting of existing transmission and distribution lines that have the highest risk of avian and bat mortalities.

5. The Service recommends working toward making the proposed project carbon neutral. Consistent with the Intergovernmental Panel on Climate Change (2007a,b) adaptation strategies/mitigation recommendations, the Service recommends compensating for the proposed project's carbon footprint (1,726.13 metric tons of carbon dioxide) (Reclamation 2009b) by purchasing carbon offsets. Alternatively, carbon offsets could be achieved by tidal marsh restoration, reforestation, or planting nest trees for raptors in areas away from transmission lines and sensitive prey species.
6. Reclamation and WAPA should consult with CDFG under CESA and the California Environmental Quality Act (CEQA) for impacts to State-listed and Fully Protected species and Species of Special Concern.

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

REINITIATION NOTICE

This concludes formal consultation on the proposed Delta-Mendota Canal/California Aqueduct Intertie Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals that the agency action 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 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 any questions regarding this biological opinion please contact Joseph Terry or Ryan Olah, Coast/Bay Branch Chief, at (916) 414-6600.

cc:
Scott Wilson, California Department of Fish and Game, Yountville, California
Sandy Morey, California Department of Fish and Game, Rancho Cordova, California

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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-1156-2

NOV 12 2009

Memorandum

To: Michelle H. Denning, Regional Planning Officer, U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, California

From: Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Amendment to the Section 7 Formal Consultation on the Delta-Mendota Canal/California Aqueduct Intertie Project, Alameda County, California

On October 29, 2009, the U.S. Fish and Wildlife Service (Service) provided the U.S. Bureau of Reclamation (Reclamation) the Service's biological opinion on the effects of the Delta-Mendota Canal/California Aqueduct Intertie Project in Alameda County, California (Service file # 81420-2009-F-1156) on the threatened California red-legged frog (*Rana aurora draytonii*) and the threatened California tiger salamander (*Ambystoma californiense*) under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act). The biological opinion contained a typographical error in term and condition number 1(1)(b) on Page 41 incorrectly stating the number of acres of upland habitat for the California red-legged frog and the California tiger salamander that would be permanently lost and the number of conservation bank credits required to be purchased.

Thus, the Service makes the following changes to term and condition 1(1)(b) in the biological opinion:

Remove the following sentences from term and condition number 1(1)(b) on Page 41:

> Reclamation shall compensate for the permanent loss of 2.1 acres of upland habitat for the California red-legged frog and California tiger salamander by purchasing mitigation credits at a Service-approved mitigation or conservation bank at a 3:1 ratio (acres of habitat preserved to acres of habitat lost). Prior to or by the start of construction, Reclamation shall purchase 6.3 conservation bank credits at a Service-approved conservation bank whose service area encompasses the action area for the two species.

Replace the above sentences in term and condition number 1(1)(b) on Page 41 with the following:

> Reclamation shall compensate for the permanent loss of 1.2 acres of upland habitat for the California red-legged frog and California tiger salamander by purchasing mitigation credits at a Service-approved mitigation or conservation bank at a 3:1 ratio (acres of habitat preserved to acres of habitat lost). Prior to or by the start of construction, Reclamation shall purchase 3.6 conservation bank credits at a Service-approved conservation bank whose service area encompasses the action area for the two species.

If you have any questions regarding this biological opinion please contact Joseph Terry or Ryan Olah, Coast/Bay Branch Chief, at (916) 414-6600.

cc:
Scott Wilson, California Department of Fish and Game, Yountville, California
Sandy Morey, California Department of Fish and Game, Rancho Cordova, California