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Memorandum

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

From: E. Tattersall
Assistant Field Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Intra-Service Biological Opinion on the Issuance of a Section 10(a)(1)(B) Incidental Take permit to the Pacific Gas and Electric Company for the Pacific Gas and Electric Company Bay Area Operations & Maintenance Habitat Conservation Plan

In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA or Act) and its implementing regulations (50 CFR §402), this document transmits the intra-service biological opinion (Opinion) of the U.S. Fish and Wildlife Service (Service), Sacramento Fish and Wildlife Office (SFWO), regarding proposed issuance of a section 10(a)(1)(B) incidental take permit (Permit or Proposed Permit) to Pacific Gas and Electric Company (PG&E)(Applicant), for the implementation of the Pacific Gas and Electric Company Bay Area Operations & Maintenance Habitat Conservation Plan (HCP or PG&E Bay Area O&M HCP). The Service proposes to issue the Permit to the Applicant for a period of 30 years.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction or the destruction of endangered plants on non-Federal areas in violation of State law or regulation (i.e. Fish & Game Code §§2050-2085) or in the course of any violation of a State criminal trespass law (i.e. Penal Code §§ 594-625c). Therefore, although federally listed plants do not need to be included in an incidental take permit, plant species will be covered by the Proposed Permit in recognition of the conservation benefits provided by the Plan. In addition, the Service is still required to review the effects of its own actions on listed plants, even when those listed plants are found on private lands. This intra-Service section 7 consultation will also determine if issuing the Proposed Permit could "jeopardize the continued existence" of any federally listed plant. Assurances provided under the Service's "No Surprises" rule at 50 CFR. §17.13, 17.22(b)(5) and 17.32(b)(5) will extend to all Covered Species, including all plants proposed for coverage.

The Applicant is requesting a permit to incidentally take 19 wildlife species and are seeking assurances for 13 plant species, for a total of 32 species (collectively Covered Species). Nineteen wildlife species proposed for coverage are currently listed as federally threatened (T) or endangered (E) and thirteen plant species proposed for coverage are currently listed as threatened or endangered. The Covered Species list is provided below:

1. California freshwater shrimp (*Syncaris pacifica*) (E)
2. Conservancy fairy shrimp (*Branchinecta conservatio*) (E)
3. Longhorn fairy shrimp (*Branchinecta longiantenna*) (E)
4. Vernal pool fairy shrimp (*Branchinecta lynchi*) (T)
5. Vernal pool tadpole shrimp (*Lepidurus packardi*) (E)
6. Delta green ground beetle (*Elaphrus viridis*) (T)
7. Bay checkerspot butterfly (*Euphydryas editha bayensis*) (T)
8. Callippe silverspot butterfly (*Speyeria callippe callippe*) (E)
9. Lange's metalmark butterfly (*Apodemia mormo langei*) (E)
10. Mission blue butterfly (*Icaricia icarioides missionensis*) (E)
11. San Bruno elfin butterfly (*Callophrys mossii bayensis*) (E)
12. California tiger salamander (*Ambystoma californiense*)(Central California Distinct Population Segment) (Central California tiger salamander) (T)
13. California tiger salamander (*Ambystoma californiense*)(Sonoma County Distinct Population Segment) (Sonoma California tiger salamander) (E)
14. California red-legged frog (*Rana draytonii*) (T)
15. Alameda whipsnake (*Masticophis lateralis euryxanthus*) (T)
16. San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) (E)
17. California clapper Rail (*Rallus longirostris obsoletus*)(also known as Ridgeway's Rail (*Rallus obsoletus*)) (E)
18. Salt marsh harvest mouse (*Reithrodontomys raviventris*) (E)
19. San Joaquin kit fox (*Vulpes macrotis mutica*) (E)
20. Pallid manzanita (*Arctostaphylos pallida*) (T)
21. Sonoma sunshine (*Blennosperma bakeri*) (E)
22. Coyote ceanothus (*Ceanothus ferrisae*)
23. Fountain thistle (*Cirsium fontinale* var. *fontinale*) (E)
24. Santa Clara Valley dudleya (*Dudleya setchellii*, also known as *Dudleya abramsii* ssp. *setchellii*) (E)
25. Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*) (E)
26. Marin dwarf-flax (*Hesperolinon congestum*) (T)
27. Burke's goldfields (*Lasthenia burkei*) (E)
28. Contra Consta goldfields (*Lasthenia conjugens*) (E)
29. Sebastopol meadowfoam (*Limnanthes vinculans*) (E)
30. Antioch Dunes evening-primrose (*Oenothera deltoides howellii*) (E)
31. White-rayed pentacheata (*Pentachaeta bellidiflora*) (E)
32. Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*, also known as *Streptanthus glandulosus albidus*) (E)

This Opinion was prepared using the following information, and portions are hereby incorporated by reference:

1. September 2017 Final PG&E Bay Area Operations and Maintenance Habitat Conservation Plan;
2. September 2017 Pacific Gas & Electric Company Bay Area Operations and Maintenance Habitat Conservation Plan Final Environmental Assessment;
3. Electronic mail correspondence, telephone conversations, site visits, and meetings between the Service and the Applicants between 2006-2017;
4. References cited in this Opinion; and
5. Other information available to the Service

Ten wildlife species and three plant species presently have Critical Habitat designated. The Covered Species with designated Critical Habitat are: Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Delta green ground beetle, Bay checkerspot butterfly, Central California tiger salamander, Sonoma California tiger salamander, California red-legged frog, Alameda whipsnake, Contra Costa wallflower, Contra Costa goldfields, and Antioch Dunes evening primrose. If the Service determines that PG&E and the HCP meets the statutory requirements for an HCP the Service will issue the Permit. Upon issuance of the Permit, incidental take will be authorized for all Covered Species, and the PG&E will implement the HCP for all Covered Species.

There are numerous listed species with the potential to exist in the action area that have not been included for coverage in the HCP. The final list of covered species that PG&E is requesting incidental take for was refined through the application of the following criteria, as described in HCP Chapter 1, *Introduction*, section 1.5.2 *Covered Species*, and summarized here: 1) the species is known to occur or likely to occur within the Plan Area; 2) the species is currently listed as threated or endangered under the Act, or was judged to have a high probability of being listed during the permit term; 3) the species may be adversely affected by PG&E's covered activities even with the implementation of avoidance and minimization measures; and 4) sufficient data exists on the species' life history, habitat requirements, and occurrence within the Plan Area to estimate the effects on species and develop conservation measures to avoid or minimize those effects. The Service reviewed all federally listed species that may occur within the action area as well as PG&E's list of proposed Covered Species. The Service's determination of may affect, but not likely to adversely affect these species is identified in our intra-Service consultation evaluation form (see Appendix A). If an individual project, that would also be a Covered Activity, is likely to adversely affect (pursuant to section 7) or is reasonably certain to result in take (pursuant to section 10) one or more of these species, that project is not covered by the HCP or Permit and will be analyzed on a project-by-project basis by the Service via a separate section 7 consultation, or separate section 10 permit, as appropriate. See the Service's intra-Service evaluation form for a list of other non-covered federally listed species that have the potential to occur within the action area and the Service's determination for each of those species:

The remainder of this document provides our biological opinion on the effects of the proposed action on the 32 covered species listed above.

Consultation History

November 7, 2006:	The Service published a Notice of Intent to prepare an Environmental Impact Statement and to initiate scoping in the Federal Register.
November 2006 - September 2017	Meetings, correspondence, and telephone calls between the Service and PG&E on the development of the HCP.
March 24, 2017	The Service published a Notice of Availability in the Federal Register withdrawing our 2006 Notice of Intent to prepare an Environmental Impact Statement and initiated a 30-day public comment period for the draft HCP and draft EA.
April 24, 2017	The public comment period for the draft Environmental Assessment closed.

May 11 2017	The Service notified the public of an extension to the public comment period on the draft HCP to June 23, 2017, and announced that the Service would hold two public workshops in June, 2017 to provide an overview of the draft HCP and seek additional public comments on the draft HCP.
June 12 and June 19, 2017	The Service held two public workshops on the draft HCP.

BIOLOGICAL OPINION

Description of the Action

Plan Overview

The PG&E Bay Area O&M HCP is a multi-species, 30-year plan intended to protect and conserve 32 Covered Species (including two DPSs of California tiger salamander) and other biological resources at facilities and easements managed by PG&E in the San Joaquin Valley. The HCP is designed to support an application for a Federal Permit under section 10(a)(1)(B) of the Act. The purpose of the proposed HCP is to enable PG&E to continue to conduct current and future O&M and minor construction and Covered Activities in the San Joaquin Valley while avoiding, minimizing, and compensating for possible direct, indirect, and cumulative adverse effects on threatened and endangered species or designated critical habitat which could result from such management activities. The intent of the HCP is to minimize incidental take of the Covered Species in the action area and to provide avoidance, minimization, and compensation measures for the effects of Covered Activities on the Covered Species and their habitat. Although herbicides use is mentioned in some of the Covered Activity descriptions below, the use of these chemicals are not covered activities and any adverse effects to federally listed species are not authorized by this biological opinion nor the Service's incidental take permit. The information below with respect to herbicides is merely to provide more complete information of PG&E's practices. PG&E proposes to cover activities related to the operation and maintenance of its natural gas and electric systems:

Plan Area

The HCP overlaps Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco Counties; collectively this area is known as the study area. Within the greater study area, the Plan Area consists of PG&E gas and electric transmission and distribution facilities, Right of Ways (ROW), and a buffer area, the lands owned by PG&E and/or subject to PG&E easements to maintain these facilities, private access routes associated with PG&E's routine maintenance, and mitigation areas acquired to mitigate for the impact of the taking resulting from Covered Activities. The total Plan Area is approximately 402,440 acres; 128,735 acres (32 percent) are in natural land-cover types, 246,777 acres (61 percent) are in urban areas and 26,928 acres (7 percent) are in agricultural areas. The Plan Area includes estimates, based on discussions with facility staff, of unmapped facilities (1 percent of electric and gas transmission, 3 percent of electric distribution, and 10 percent of gas distribution) and projected minor new construction areas. The Permit Area is synonymous with the Plan Area.

Covered Species

Covered Species are listed on page 2 of this Memorandum.

Covered Activities

The Bay Area O&M HCP covers a number of activities that are related to PG&E's natural gas and electric transmission and distribution systems that are reasonably certain to result in take of one or more Covered Species and that are located in the Plan Area. Covered Activities will occur at or near existing facilities. Minor new construction activities include installing new or replacement structures to upgrade facilities or to extend service to new customers. Minor new construction, when in natural vegetation or agricultural lands that contain suitable habitat for Covered Species, is limited to 2 miles or fewer of new electric or gas line extensions from an existing line, a total of 1.0 acre or less of new gas pressure limiting stations (PLSs) within the HCP study area, and 0.5 acre or less per electric substation expansion. End-to-end extensions exceeding 2 miles are not covered. Multiple 2-mile extensions in different geographic areas are be covered, but each would be treated as a separate activity. The size of a minor new construction project is estimated as the total footprint, expressed in acres. Consistent with the requirements of NEPA, the HCP will not allow segmentation of proposed construction to obtain coverage under the HCP. Covered Activities include inspection, field testing, and potentially replacing many pipeline segments to ensure reliable and safe delivery of gas to customers. Pipeline replacements are estimated to average between 4 miles and 8 miles and are primarily in urban areas. However, there would also be replacement of natural vegetation.

The proposed Federal discretionary action is the issuance of a section 10(a)(1)(B) incidental take permit (Permit) which addresses 31 species that are reasonably certain to be taken by the activities proposed for coverage in the HCP (A-D below).

A. Activities Similar Across Multiple Natural Gas Projects

Items 1-10 below are general descriptions of the methods PG&E uses for access, staging, clearing, grading, erosion control, trenching and excavating, and crossings that are similar across all the individual categories of Covered Activities under the Natural Gas Line of Business.

1. Access: Generally, facilities are located in areas where PG&E crews can use existing public and private roads to access the facilities' ROWs. In general, pickup trucks or small sport utility vehicles are used to access the facilities. PG&E is seeking coverage for its access on roads and for construction of temporary access roads. The most rural private roads may be dirt or gravel and periodically may require repair or maintenance. The gas and electric facility road maintenance practices and potential impacts are discussed under the G13b Covered Activity description. In the event that no road exists or an emergency arises, offroad travel or construction of a new temporary access road may be necessary. PG&E restricts speed limits to those deemed safe for site-specific driving conditions—not faster than 15 miles per hour (mph)—and may further restrict speeds if Covered Species are present. PG&E periodically creates temporary access roads when access to a Covered Activity site is not readily available. Temporary access roads are usually required for larger-scale activities, such as installing new gas pipelines or accessing pull sites for electric reconductoring projects. While the exact location of all temporary roads cannot be determined at this time, the HCP includes measures designed to site all roads to minimize impacts on Covered Species and their habitats through PG&E's environmental screening process, as described in the *Conservation Strategy* section of this document, and in Chapter 5 of the HCP. PG&E creates these roads within a minimum impact area and ultimately decommissions them, typically restoring the area to preconstruction conditions at the completion of the Covered Activity. In some instances, however, roads may be left in place to provide site access for annual

patrols or inspections. The Covered Activity descriptions below include discussion of construction of temporary access roads, as appropriate.

2. Staging: Staging area may be necessary for large-scale Covered Activities, such as pipeline replacement. PG&E determines the location of the proposed staging areas during the screening process and locates the staging areas to avoid and minimize impacts on sensitive resources. If sensitive resources such as water bodies, wetlands, or modeled habitat are present, a biologist demarcates the sensitive resources with flagging or temporary orange construction fencing before construction. PG&E typically uses larger trucks to transport pipes and equipment such as tracked vehicles (i.e., vehicles that run on continuous tracks instead of wheels). Crews park, store, and stage construction equipment in these designated areas. PG&E restores staging areas to preconstruction conditions at the completion of the activity. The individual Covered Activity descriptions further discuss the anticipated sizes of the staging areas.

3. Clearing: Activities involving clearing, such as transmission line construction, conform to agreements with the landowner when the activity is on private property, or to permits issued by regulatory and land management agencies. After staking the work area, maintenance personnel remove trees and brush (clear and grub such obstacles as rocks or tree stumps by mechanical means) within the construction ROW to the extent necessary to allow safe and efficient use of construction equipment.

4. Grading: PG&E limits grading to the area necessary to ensure the safe movement of construction equipment in the ROW and designs its Covered Activities that involve grading to minimize impacts on natural drainage and slope stability. Construction footprint calculations include acres of potential impacts from grading. Where steep terrain requires the ROW to be graded at two elevations (two-toning), PG&E recontours such areas after construction to approximate preconstruction topographic conditions and implements erosion control measures to prevent runoff. If the disturbed area is greater than 0.1 acre, PG&E crews also mulch, reseed, and fertilize the area.

   Sometimes PG&E must temporarily install prefabricated bridges or culverts in the ROW or in access roads to ensure safe access and reduce environmental impacts in accordance with state and federal regulations. If the bridge is needed for only a short duration, then a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing is required, a culvert is installed after PG&E obtains all appropriate permits from the regulatory agencies.

   During the grading phase, PG&E segregates topsoil from subsoil and windrows the topsoil within the designated work site. During periods of rain, soil piles are covered, consistent with applicable stormwater permits. The soil is typically covered with plastic sheeting and secured with gravel bags or other weights no more than 10 feet apart to minimize the potential for erosion. Surface rocks, where present and useful for reclamation, are set aside with the topsoil windrow. If not reclaimed, the rocks are taken to a landfill. PG&E makes every attempt to cover the pipeline by placing the subsoil over the pipe first and then spreading the preserved topsoil evenly over the graded area.

5. Erosion Control: PG&E reviews various types of erosion control and implements applicable best management practices (BMP) identified in the California Stormwater Best Management

Practices Handbook published by the California Stormwater Quality Association (2014). For example, PG&E employs erosion control techniques to preclude pipeline washout, gully development, and sedimentation of local drainages. Standard erosion control measures may include installation of water bars along temporary or dirt roads, diversion channels and terraces to reduce erosion and runoff, ditch plugs installed in ditches to prevent washout, and other soil stabilization practices such as jute mats, wood mulching, straw mulch, and other methods described in the handbook. The type(s) chosen depends on the situation and the condition of the site. PG&E uses permanent articulating cement ground mat systems (i.e., erosion control or "Ercon" mats) and riprap infrequently—on less than 100 linear feet of stream each year in the Bay Area—and only when other biomechanical methods cannot be used or when repairs are made to existing riprap structures. If biomechanical methods cannot be used or repairs to existing riprap are needed, PG&E uses the minimum riprap necessary to accomplish the activity and so that it will not exceed a total of 100 linear feet per location. PG&E does not undertake vegetation removal, grading, or substantial alteration of drainage conditions when performing erosion control work.

6. Trenching and Excavating: The process of excavating the pipeline trench varies according to location, soil type, and terrain. PG&E conducts trenching and excavating in accordance with California Occupational Safety and Health Administration (Cal/OSHA) requirements for employee and public safety. Self-propelled trenching machines or backhoes are used for trench excavation on moderate terrain. Trenches crossing waterways are excavated using a backhoe, dragline, or clamshell. PG&E schedules trenching for the summer, when the creeks are dry; otherwise, a tunneling method such as jacking and boring or horizontal directional drilling (described below) is used. If workers encounter rock or rocky formations, tractor-mounted mechanical rippers are used to expedite excavation. In areas where mechanical rippers are not practical or sufficient, rock trenching equipment may be employed. The width and depth of the trench depends on the diameter of the pipe, soil type, terrain, and minimum depth requirements. Typically, the trench is 12 inches wider than the diameter of the pipe. The trench must be deep enough to achieve adequate soil cover over the pipe. The following minimum soil covers apply to the described areas: uncultivated areas (2.5–3 feet); Cultivated areas (3–6 feet); Rocky areas: 1.5–2 feet.

   In areas where it is necessary to trench through topsoil and subsoil, a two-pass trenching process is used. The first pass removes topsoil, and the second pass removes subsoil. Removed soils (spoil) from each excavation are stored in separate rows. This technique allows proper soil-profile restoration after backfilling. Windrows contain gaps at appropriate locations to prevent stormwater runoff from ponding. Bank stabilization methods depend on site-specific conditions, but, under the Bay Area O&M HCP, work materials and methods would be consistent with species conservation needs and in accordance with any acquired U.S. Army Corps of Engineers (Corps) Clean Water Act Section 404 and California Department of Fish and Wildlife (CDFW) permits or agreements.

   PG&E field crews implement other BMPs as needed to provide erosion control and to prevent construction runoff from entering the streams. In cultivated and improved areas and areas with thin layers of topsoil, it is sometimes necessary to remove and stockpile topsoil within the construction ROW until the trench is backfilled. This effort could last up to 3 weeks. The stockpiled topsoil then is distributed evenly across the disturbed portion of the ROW during cleanup.

PG&E crews clear the trench of loose rocks and, when necessary, provide imported material or other suitable bedding material as a cushion for the pipe. Backhoes are used to clean the trench after ripping, or, in extremely rare circumstances, blasting is implemented after other alternatives, such as rerouting, are exhausted. PG&E minimizes the length of exposed trench to the extent possible and provides access across the trench at convenient intervals for public safety.

7. Crossings: Boring and open trenching are typical construction methods for crossings (crossing types are described below). PG&E typically uses boring when crossing active waterways, railroads, and major roadways. The three most common boring methods are jack-and-bore, horizontal directional drilling, and microtunneling. The method is based on the crossing type, soil type, terrain, and type of facility being installed. PG&E generally avoids open trenching unless a waterway is very small or seasonal.

    - Jack and bore: PG&E often uses this boring method (also referred to as dry bore) to cross major highway systems (all federal and state highways) and railroads, as well as places where open cuts are prohibited. Crews excavate each side of the crossing to accommodate the equipment (a boring auger). The displaced fill is either stockpiled or removed, depending on whether the area will be permanently affected or if PG&E will revegetate it following a temporary disturbance. Stockpiling is done within the ROW. The bore could be for a pipe ranging from 2 to 24 inches in diameter. Sacrificial pipe, the same size as the pipe being installed, typically is used as a sleeve for the boring auger. This sleeve is pushed under the crossing as the auger drills through the soil. The permanent gas pipe is then pushed through and attached to the sacrificial pipe. The pipe is cut in short lengths to accommodate the limited excavation area then welded to the inserted piece ahead of it and jacked into place. The average size of the excavation or trenching is 10 feet wide by 40 feet long. PG&E uses the same method if casing pipe is necessary. The casing pipe, sized larger than the carrier pipe, is installed as a sleeve for the boring auger. The gas pipe then is installed through the casing. Cased crossings have vent pipes that extend above ground, have cathodic protection, and are appropriately marked.

    - Horizontal directional drilling: Longer distances, typically more than 120 feet, can be drilled using this method rather than the jack-and-bore method. Directional drilling, which PG&E most often uses to cross large waterways, is the preferred method for conduit installation to minimize surface disturbance. The only excavation required is a "mud pit," approximately 6 feet wide by 6 feet long by 3 feet deep. The tunnel is drilled from surface to surface, and a registered engineer determines the pipe's maximum angle of deflection. Workers set up a drilling machine on one side of the crossing at the appropriate location. The auger drills at a predetermined angle from the surface elevation toward the crossing; the angle is prescribed to attain the correct depth below the feature being crossed. During drilling, a mud solution, typically bentonite, is pumped into the tunnel along with other additives to maintain the tunnel's shape and integrity. Crews use only nontoxic additives when drilling under streams and typically the Corps or CDFW requires a "frac-out" plan as a standard permit condition (see below). This solution also reduces friction during installation of the pipeline. The drilling machine pulls the pipeline through the tunnel. The mud solution is pumped into a truck as the pipeline displaces it. Once the pipeline is installed, both ends are excavated and cut off at the appropriate depth to match the

rest of the pipeline. PG&E contains the soil removed during drilling within the mud solution and tests it for contaminants prior to hauling the solution offsite and disposing of it at landfills that accept such material.

- Microtunneling: This is PG&E's preferred method for stream crossings. PG&E also often uses microtunneling in extremely wet conditions where it is necessary to control the amount of soil being removed as the boring head progresses. Each side of the crossing is excavated to accommodate the boring equipment (i.e., a jetting head and suction equipment). Microtunnel excavation can be a trench as small as 10 feet by 40 feet or as large as 50 feet by 50 feet, depending on the required depth. A jetting head containing multiple high-pressure water jets is attached to the pipe being installed. Crews use plumbed or tanked water—not water from adjacent streams or rivers. Water forced through the jets dislodges the soil as the head is pushed, and the pipe is installed behind it. Suction equipment controls the amount of soil being removed to accommodate the forward progress of the jetting head and pipeline. Only the soil displaced by the pipeline is removed. PG&E crews capture water used during this process in baker tanks and dispose of it according to state and federal water quality regulations.

- Open-trench waterway crossings: PG&E rarely uses an open-trench waterway crossing and does so only when a waterway is very small or seasonal. If PG&E uses the open-trench technique for river crossings, a trench is opened in the streambed using backhoes, backhoes on barges, clamshells, or draglines, depending on the streamflow characteristics. Flow is maintained at water crossings during construction using bypass piping and temporary cofferdams. At large rivers, spoil removed from the trench is stockpiled out of the water within designated work sites but not where it can re-enter surface waters. The pipeline is placed at least 6 feet below scour depth. A plug of unexcavated soil is left at each bank of the stream or river crossing to preserve the integrity of the streambank. PG&E crews do not remove these plugs until necessary for installation of the pipe. The entire length of pipe for the crossing is assembled as a unit, tested and then placed in the trench. After installation, crews backfill the trench and the streambank, stabilize the soil through compaction, and restore the area to approximate preconstruction conditions. PG&E's bank stabilization methods depend on site-specific conditions, but work materials and methods are consistent and in accordance with state and federal water quality regulations. For safe construction, PG&E conducts hydrologic evaluations for any major planned crossings during the appropriate time of year, as required.

- Contingency Planning for Frac-Outs: Drilling fluid fractures, commonly called frac-outs, occur when the pressure of the drilling lubricant escalates, fractures the soil, and allows the drilling fluids to escape the bore. PG&E crews design and direct the drilling operation in such a way as to minimize the risk of spills of all types. PG&E typically prepares a site-specific frac-out plan that outlines standard precautionary measures to control and clean up the drilling lubricant. The frac-out plan includes the following: a point-of-contact list in the event a frac-out or spill occurs, guidance for when drilling should occur (such as performing drilling during daylight hours so that the loss of bentonite or machine pressure can be visually identified), and a list of tools and equipment required onsite to clean up and remove the drilling fluid. The point-of-contact list also outlines the notification procedure to inform all agencies

with jurisdiction of the waterway of the nature of the incident. In addition to permit conditions and frac-out plan guidance, projects that require contingency planning for frac-outs typically require the preparation and implementation of a stormwater pollution prevention plan (SWPPP) that contains detailed methods and measures to avoid spills.

- River, stream, and backwater crossings: River crossing methods vary according to specific river characteristics, such as width, depth, flow, and riverbed geology. PG&E conducts construction in accordance with permits and agreements issued by USACE, CDFW, The Service, and other appropriate regulatory agencies. Construction may require separate review and approval in accordance with the terms of the specific permits or agreements. Pipelines crossing major streams and rivers are coated with concrete prior to installation to provide negative buoyancy and protection from erosion. PG&E installs temporary vehicle crossings for construction traffic only if an existing crossing, such as a bridge, is not available in the vicinity. Temporary vehicle crossings consist of culvert bridges, Flexifloats, or portable bridges.

- Fault crossings: Where geologic studies suggest a high potential for ground rupture, PG&E crews design the fault crossing to avoid overstressing the pipe in the event of differential movement. The designs of fault crossings vary, depending on the type of fault and the likelihood, amount, and potential consequences of expected fault displacement. To address the potential for fault displacement, the pipeline trench is widened and deepened to accommodate the anticipated fault displacements. The pipeline in the fault zone is completely suspended in granular bedding material to minimize the resistance of the trench backfill to displacement of the pipe. The pipe is expected to remain fixed relative to movement of the trench as fault displacement takes place.

- Road, railroad, and utility crossings: PG&E uses the open-trench method when crossing roads with light traffic and where local authorities or owners of private roads permit this crossing method. PG&E provides a temporary road detour to the shoulder of the road or a construction bridge consisting of plating for trenched thoroughfares. Boring or manually exposing the pipe or cable are generally the methods used to cross under underground utilities. Jack-and-bore and jack is the typical boring method used at railroad crossings.

- Aqueduct and canal crossings: Site-specific circumstances determine the construction method PG&E uses for crossing aqueducts and canals. In most cases, boring is appropriate. Where required or necessary, crews construct an aerial suspension system for the pipeline.

8. Pipe Placement: Large trucks transport lengths of pipe, valves, and fittings to the ROW or work area, and PG&E crews unload the materials. Crews typically assemble sections of pipe requiring angle joints in the field using prefabricated elbow sections so that the pipe conforms to the contours of the terrain. The pipe joints are welded, X-rayed, inspected, and field-coated to prevent corrosion. The material used for field coating depends on the location of the pipe. Epoxy is the preferred material for protecting seam welds and is sprayed or brushed directly on the pipe below ground.

Once the welding of the pipe seam is completed and inspected, large trucks or track-mounted equipment lower the pipeline into the trench. (Work crews bring this equipment to the Covered Activity site on a truck.) Typically, the old pipe is filled with slurry and abandoned in place or cut and capped. The trench then is backfilled with the excavated material. If the excavated material has too much rock for placing around the pipe, a rock-free material is imported and placed around and over the pipe to a depth of 1 foot. Surplus material is used to form an earthen crown over the trench and allow for settling of the backfill. PG&E ensures work crews compact all excavations and trenches to be in adherence with the specific requirements at each location. The industry standard minimum compaction requirement for ROWs is 85 percent.

9. Pipeline Marking: PG&E crews install identifying markers over the centerline of the pipeline. These markers show the general location and direction of the pipeline, identify the owner of the pipeline, and convey emergency information in accordance with applicable regulations. Additional markers (fence post-like structures with attached signs) are placed on streambanks rather than in waterways, and are also placed on roads, fences, public access crossings, and edges of agricultural fields. If the new or replacement pipeline is located immediately adjacent to an existing pipeline, the markers are installed near those for the existing pipeline. Special markers providing information and guidance to aerial patrol pilots also may be installed.

10. Cleanup and Restoration: The final phase of pipeline installation involves cleanup and restoration of the ROW. The goal of restoration is to achieve compatibility with pre-existing vegetative conditions, in accordance with standard procedures approved by federal and state regulatory authorities. PG&E removes construction material and re-contours disturbed areas to their pre-project grade. Depending on the nature of the site and the type of installation that took place, several tasks may be involved in the cleanup and restoration. For example, placement of a pipeline or other infrastructure in a trench results in surplus soil that cannot be returned to the trench. The surplus soil normally is distributed evenly over the disturbed section of the ROW. If a property owner objects to this approach, the surplus soil is deposited at an approved local dumping site. Restoration of the ROW surface involves smoothing it with motor graders or disc harrows. Restoration may also require stabilizing slopes by recontouring, creating slope breaks or diversion ditches, or using dirt, sandbags, or other materials to stabilize the soil and direct runoff away from disturbed areas. On cultivated or improved lands, PG&E crews take measures to remove rocks and leave the ground surface in a condition satisfactory to landowners. If the disturbed area is greater than 0.1 acre, crews also mulch, reseed, and fertilize, as needed and pursuant to landowner agreement. For some projects (e.g., gas pipeline projects), restoration may not occur in certain areas, such as riparian areas, serpentine habitats, or blue oak woodlands where the ROW has become overgrown and operational requirements dictate that access to and through the ROW be maintained for annual patrols and inspections, especially at creek and river crossings. In those situations, PG&E mitigates the impacts as permanent impacts.

B. Natural Gas System

Natural gas is initially captured in a well where pressure helps the gas rise to the surface naturally. The gas is then processed at plants, sent through a compressor station to increase pressure, and then moved to an underground storage facility or network of (primarily underground) transmission lines. Throughout the gas system, regulator stations maintain the pressure of the gas as it travels through

the transmission pipelines. Safety valve monitors are also installed along the gas system to ensure the regulator station is accurately maintaining the gas pressure. These monitors are designed to reduce pressure quickly if the gas exceeds specified limits. Before gas enters the distribution system that distributes gas from the regulator stations to customers, the pressure is reduced from transmission levels to distribution levels. PG&E monitors and adjusts pressure and flow rate as needed at gas pressure limiting stations. In the Bay Area, PG&E owns 1 compressor station (Bethany compressor station in eastern Alameda County), 1,820 miles of gas transmission pipelines, and 19,350 miles of gas distribution pipelines.

PG&E's natural gas system consists of a transmission system and a distribution system. The transmission system in the Plan Area is composed of 16 primary gas transmission lines totaling approximately 1,820 miles of pipeline. The largest two facilities are Line 2 and Lines 300A and B. Line 2 is a 115-mile-long (of which 13.3 miles are within the Bay Area), 12- to 20-inch-diameter pipeline that runs from the Brentwood Terminal in Contra Costa County to the Panoche Metering Station in Fresno County. Lines 300A and B are 502-mile-long (of which 42 miles are within the Bay Area), 34-inch-diameter pipelines that run from the California/Arizona border near Needles, California, to PG&E's Milpitas Terminal in the Bay Area.

The transmission system transports natural gas in steel pipelines buried 3 to 4 feet deep (measured to the top of the pipe). The pipe diameter is 8 to 42 inches. Gas pressure in transmission pipelines generally exceeds 60 pounds per square inch (psi). The Bethany Compressor Station located in the Plan Area maintains the gas pressure in the pipelines.

The gas distribution system consists of approximately 19,350 miles of both steel and plastic lines within the Plan Area. Typically, the 0.25- to 24-inch-diameter lines are buried 2 to 4 feet deep. Gas pressure in distribution pipelines is generally less than 60 psi. Approximately 90 percent of the gas distribution lines are in urban areas. The transmission and distribution pipelines are buried in native soil; however, in areas of rocky soil, imported backfill is used to offset potential damage to the pipes. The ROW width of the natural gas system varies from 5 to 150 feet. PG&E owns less than 1 percent of the linear ROW in fee title; the remainder is in private easements and/or public utility easements (i.e., franchise).

Generally, PG&E has nonexclusive easements without the right to fence the pipeline corridors. PG&E may obtain exclusive easements with the right to construct fences when security fencing is required for valve lots, compressor station(s) and other aboveground facilities, or subsurface vaults.

PG&E performs all work practices in accordance with federal, state, and local environmental, safety, and construction regulations and standards. Where applicable, PG&E conducts the work in accordance with landowner agreements.

Items 1-16 below are descriptions of categories of Covered Activities associated with the Natural Gas Line of Business.

1. G1. Patrols

    - Aerial Patrol: PG&E conducts aerial patrols of gas pipelines and associated facilities quarterly using fixed-wing aircraft that fly at an elevation of 500 feet. Helicopters are used periodically as needed.

- Ground Patrol: Compliance with California Public Utility Commission (CPUC) measures requires periodic ground patrols of the gas transmission lines. On a quarterly to annual basis, PG&E conducts ground patrols of the pipelines and associated facilities on foot, with ATVs, or by using small trucks or SUVs on existing access and pipeline patrol roads. The purpose of the patrols is to observe surface conditions on and adjacent to the transmission line ROW and look for indications of leaks, ensure that pipeline markers are clearly visible, and record conditions that might affect safety and operation. Ground patrols also read gas meters.

- Leak Detection Patrol: PG&E conducts leak detection patrol of the gas facility system at either 6-month or 12-month intervals. Leaking gas from pressurized pipelines can present hazardous conditions that must be corrected. The patrol is conducted on foot or by small trucks, depending on the terrain and accessibility. PG&E uses either a portable hydrogen-flame ionization gas detector or a laser-methane detector to sample air above the gas line to test for leaks. Where vegetation has overgrown in the ROW, vegetation pruning or removal of a 2- to 4-foot-wide path is required to allow safe access for the crew conducting the patrol. The ROW clearing width varies depending on the site location and vegetation type; the focus is on minimizing impacts on natural vegetation. Section 3.2.3.13, G13. Pipeline Right-of-Way Vegetation Management, which discusses the G13a Covered Activity, describes and calculates estimated disturbance from vegetation clearing. PG&E estimates that the entire gas transmission and distribution system is patrolled once per year.

2. G2. Inspections

- Valves: Valves are located along all pipelines at different intervals depending on the size of the line and number of taps off the line. PG&E inspects the valve sites along the pipelines and tests the valves three to four times per year. Light trucks are used on existing access and pipeline patrol roads. Valves are not marked, but they are located inside vaults or fenced areas and can be accessed by a two- or three-member maintenance crew. Crews lubricate valves as necessary, using a gun pump to apply either motor oil or grease (e.g., 1,033 grease).

- Telecommunication Sites: PG&E conducts routine inspections of telecommunication sites, which are used to monitor gas pipeline functions remotely, on a monthly basis unless problems are identified at specific sites. Light trucks use existing access and pipeline patrol roads, or PG&E uses fixed-wing aircraft.

- Anode Beds: Anode beds (discussed in detail below under G8. Pipeline Cathodic Protection) are part of the cathodic protection system (CPS) and usually placed approximately every 10 to 20 miles along the pipeline. PG&E inspects cathodic protection every 2 months, or as indicated by the integrity management team, by checking the electric current at various Electric Test System (ETS) stations along the line and at anode bed sites. Simple testing instruments are used. Typical surveys may take 10 days to complete at each pipeline. Light trucks use existing access and pipeline patrol roads.

- Pressure Limiting Stations: PG&E conducts routine inspections of existing PLS every 2 months along transmission lines and annually along distribution lines. A single light truck uses existing access and pipeline patrol roads.

- Land Surveys: PG&E crewmembers periodically conduct land surveys of facilities and facility ROWs along the alignment. It is estimated that the entire gas transmission and distribution system is inspected once per year.

3. G3. Pipeline Remedial Maintenance and Internal Pipeline Inspections

- Pipeline Remedial Maintenance: Remedial maintenance corrects erosion and vandalism problems and involves the evaluation of internal pipeline issues. PG&E performs remedial maintenance at approximately 100 locations per year. The majority of these locations are in upland land-cover types, but some are in streams. Maintenance materials used for site-specific solutions to erosion problems may include biodegradable jute netting and, to a lesser extent, the periodic use of concrete, Ercon mats, or concrete pillow systems. The extent of concrete, Ercon mat, or concrete pillow system installation would not be longer than 100 feet or wider than 50 feet on any stream in the Plan Area and would comply with permits for work in waterways. PG&E installs concrete, Ercon mats, or concrete pillow systems at approximately one location per year, resulting in disturbance.

  Vandalism can affect any structures located above ground; it usually entails visual (e.g., graffiti) rather than structural impacts. Of the 100 sites maintained each year, PG&E estimates that only 10 will require fencing for protection from vandalism. Fencing these areas requires excavation for fence post installation; this action would result in a 50- by 50-foot disturbance area for each fenced location and a 50- by 50-foot work area.

  Internal Pipeline Inspections: PG&E inspects the internal coatings of its pipelines annually. Every 7 years, on average, each segment is inspected above ground by electronically measuring the integrity of the pipeline coating. Using technology such as magnetic flux leakage (MFL), PG&E inspects the pipeline with sensors to measure pipe corrosion, cracks, and indentations. During these procedures, the pipeline remains in operation. If problems are indicated, the pipeline is inspected internally using a pipeline inspection device ("pig") that is inserted into the pipe at an external launch and receiver point. No excavation is required. The pig travels throughout the length of the pipeline employing robotically operated cameras to look directly inside pipes. Once the "pigging" data are analyzed, the inspection crew conducts a calibration test (i.e., excavates a bell hole) at two or three locations along the pipeline to confirm that the pigging results are accurate. The area exposed depends on the length of pipeline where the pig has indicated possible problems. If corrosion cannot be repaired, replacement of the pipeline section is necessary (see Section 3.2.3.11, G11. Pipeline Replacement).

  PG&E internally inspects approximately 100 miles of pipeline each year, resulting in 50 inspection locations per year. On average, two or three calibration tests are conducted at each site along a 10-foot length of pipe, requiring a bell hole work area of approximately 10 feet by 10 feet along the exposed pipeline. Soil excavation, soil

stockpiling, and construction vehicle travel are within the work area during the inspection.

For the purposes of estimating impacts, PG&E assumed that all internal inspections result in a section of pipeline that needs to be replaced, and that excavation, soil stockpiling, staging, and the use of construction vehicles would disturb a 50- by 50-foot work area. PG&E hydrostatically tests the new section of pipe (see Section 3.2.5.3, G18. PSEP—Hydrostatic Testing) and disposes of the water using either a baker tank or sewer.

4. G4. Compressor Station Upgrades and Maintenance: The Bethany Compressor Station is a 100-acre facility in eastern Alameda County and within the Plan Area. The compressor station occupies a developed and fenced site. Some routinely maintained natural land is present within the grounds, and approximately 17 acres of landscaped and natural lands surround the station. PG&E conducts inspections daily and performs maintenance and upgrades two times every couple of years. Typical maintenance tasks include overhauling compressors and engines, repairing and replacing piping, painting the station, and drilling or cleaning water wells. In addition, operations and air quality standards may require modifications or upgrades to station equipment. To make such improvements, PG&E acquires approved permits to meet these standards. Inspections, maintenance, and upgrades to the Bethany Compressor Station are within the fenced facility footprint. Access to the site is from existing roads. Crews mow a strip approximately 600 feet long by 20 feet wide outside the perimeter of the facility's fence line once each year to comply with local fire standards.

5. G5. Pipeline Electric Test System Installation: The electric test system (ETS) is a component of the cathodic protection system. Units are installed 1 to 5 miles apart on pipelines to (1) determine protection system effectiveness by measuring conductivity, and (2) help crews locate the pipe prior to excavation. This technology precludes the need to systematically expose the pipe and physically examine it for signs of corrosion. The ETS consists of two wires (leads) that are welded to the pipe; the leads are exposed at the surface inside a 4-foot-tall, 4-inch-diameter plastic tube or valve box. Installation entails exposing a 3- to 5-foot-long section of pipe, attaching the leads with a small weld, and recovering the pipe. During ETS installation, the pipeline remains in operation. Most sites are accessible from existing access roads. Where an ETS is not accessible from an existing road, workers access it on foot or by use of small trucks.

   PG&E performs approximately seven ETS installations per year. At each installation site, soil excavation, soil stockpiling, and the use of construction vehicles disturb an approximate 50- by 50-foot work area.

6. G6. Pipeline Valve Maintenance – Recoating: As part of activities G10. Pipeline Coating Replacement and G11. Pipeline Replacement, PG&E may need to recoat a gas pipeline valve. Mainline valves, which are generally 7 to 20 miles apart, regulate the flow of gas through the pipeline and enable crews to isolate portions of pipeline. Occasionally, these valves malfunction or wear out, causing leaks. Depending on the condition of the valve, PG&E will either recoat or replace approximately five valves annually. Recoating is done by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion.

7. G7. Pipeline Valve Maintenance – Replacement or Automation: As part of activities G10. Pipeline Coating Replacement and G11. Pipeline Replacement, PG&E may replace a gas pipeline valve. PG&E is upgrading and automating its existing valves—or installing new automated valves when automation of existing valves is not possible—to ensure overall pipeline system safety. Once the pipeline valves are automated, PG&E will check them annually to ensure that they work properly. Approximately eight locations require maintenance each year and crews conduct maintenance within the existing facility footprint.

8. G8 Pipeline Cathodic Protection: Corrosion of underground steel pipes is a continual maintenance issue for gas system pipelines. Pipe generates or carries corrosion-cell current that, as it moves to the soil, can form pits in the pipe. These pits can weaken sections of the pressurized pipe and cause it to fail. PG&E uses cathodic protection to prevent corrosion.

   PG&E is likely to undertake approximately 100 cathodic protection activities per year using the methods described below. Of those activities, approximately 25 would require excavation, and an estimated 20 percent (five total activities) would be in natural vegetation. A work area approximately 100 by 10 feet wide is needed to install the cable, excavate the soil, stockpile soil, and house construction equipment. Most installations require 5 to 7 days to complete.

   - Anode Beds: As a pipeline's coating degrades over time, it requires increased cathodic protection to prevent corrosion. Cathodic protection is a technique to control pipeline corrosion by making the pipeline the cathode of an electrochemical cell. A cable rated for the expected current output connects the negative terminal of a rectifier, which is a small piece of equipment that is mounted on an existing utility pole, to the pipeline. A cathode protection expert adjusts the operating output of the rectifier to the optimum level after conducting various tests, including measurements of electrochemical potential. Pipe coatings commonly degrade faster in areas of high moisture content (e.g., locales with regular precipitation or irrigation) than in drier areas. Increased cathodic protection current accelerates the consumption of anode beds and decreases their effectiveness. Consequently, anode beds must be replaced periodically, and additional anodes may be needed. The pipeline continues to operate during installation or replacement of the anodes.

     Galvanic anode cathodic protection is PG&E's preferred method for distribution facilities and for use in urban areas. Galvanic anodes do not require an external power source, and installation requires minimal excavation for installation. There is some flexibility as to where the anode beds can be located, with beds usually placed approximately every 10 to 20 miles along the pipeline. The installation of anodes typically can be accomplished in a single day.

   - Deep-Well Anode Beds: Deep-well anode beds typically have a 20-year life span and are abandoned in place when no longer in use, pursuant to local environmental health department regulations. Installation of deep-well anode beds involves drilling deep ground wells (200 to 300 feet) and installing zinc or magnesium bars, platinum anode rods, or ground mats. PG&E uses this installation method where pipelines are exposed to large amounts of induced alternating current (AC) (typically from adjacent high-voltage electric transmission lines) or where soil conditions dictate. For many applications, the anodes are installed in a 200- to 300-foot-deep (or more), 10-

inch-diameter vertical hole and backfilled with conductive coke (a non-toxic carbon material that improves the performance and life of the anodes). Once an anode bed is installed, it is connected to the pipeline and the electric line by an underground cable. The deep-well anode bed typically is located approximately 10 to 15 feet from the gas pipeline and every 10 to 20 miles along the pipeline corridor. In the Plan Area, a rectifier is the standard method PG&E uses to provide electricity. The installation of deep-well anodes typically requires 4 days to complete. Work crews evenly distribute leftover fill evenly over the buried work site and grade it to blend in with the existing site, reserving topsoil to spread on top.

- Other Types of Anode Beds: Other protection measures include the installation of cathodic protection units (CPUs), anode flex and magnesium anodes, and horizontal anode beds. Although deep anodes are preferable, these other measures can be used for certain soils or in isolated corrosion areas where installing a deep well is not practical.

  Installation of CPUs involves trenching a few feet parallel to the pipeline and installing the flex or magnesium anode at the same depth as the pipeline. Trenching for CPU installation varies in width, from approximately 4 inches to 2 feet.

  Horizontal anode beds are installed parallel to the pipeline, 400 to 1,000 feet from the ROW centerline, at approximately the same depth as the pipeline. The need to install or replace a horizontal anode bed is relatively infrequent, and PG&E anticipates it will occur less than once per year in the Plan Area. A small underground cable delivers an electric current from the horizontal anode bed to the pipeline.

9. G9. Pipeline Lowering: PG&E may need to lower gas pipelines to increase the depth below surface and thereby improve public safety. The need for pipeline lowering arises mostly in agricultural areas and areas of intense land use, but it also may occur in other land-cover types or in waterways where pipe structures are exposed.

   Pipeline lowering typically involves trenching and installing a new pipeline parallel to, and to a greater depth than, the existing pipeline. The existing pipeline is then briefly removed from service and the ends are tied into the new pipeline. Typically, the old pipe is abandoned in place and either capped or filled with slurry and then capped. Pipeline lowering may be needed at any time of year, depending on operational restrictions related to the need to temporarily shut down the pipeline.

   PG&E lowers approximately 1 mile of pipeline every 3 years. A 20-foot-wide work corridor is needed for trenching and soil excavation, soil stockpiling, and the use of construction vehicles. The pipeline requires hydrostatic testing prior to pressurizing the gas pipeline (see Section 3.2.5.3, G18. PSEP—Hydrostatic Testing).

10. G10. Pipeline Coating Replacement: PG&E coats natural gas pipelines to protect them from degradation and external corrosion. When a pipeline's coating has deteriorated to the point of requiring replacement, PG&E recoats the pipe with epoxy. To determine whether the coating has maintained its integrity, PG&E induces an electric current on the pipeline at the

ETS station and then measures for a loss of voltage, which would indicate degradation in coating integrity.

To avoid bending or affecting the integrity of the pipe, the pipeline must be excavated in sections and supported at intervals typically of 40 feet. Workers remove the old coating by jetting, scraping, or sandblasting and typically place plastic sheeting or tarps below the pipe to collect the residue. PG&E performs testing to determine if the material is hazardous and then disposes of it in accordance with regulations. The surface is then prepared for the new wrap by running a self-contained grit- or shot-blasting machine over the pipe. The pipeline continues to operate while a coating machine applies the coating.

PG&E recoats approximately 1 mile of pipeline every 5 years. This Covered Activity requires construction vehicles and includes vegetation removal, trenching, soil excavation, and soil stockpiling. The section above, titled *Work Methods and Techniques*, describes the work methods and techniques to remove and replace the pipe. On average, a 20-foot-wide work area is needed for this activity. The majority of recoating is in upland land-cover types but may periodically be within streams. In intermittent and ephemeral streams, PG&E schedules instream maintenance when the stream is dry. One mile of pipeline coating replacement typically involves three different access locations.

11. G11. Pipeline Replacement: Public safety sometimes necessitates replacing sections of pipe for various reasons, including those listed below.

    - Development alongside the pipeline has resulted in a change of class location (see maintenance classes in the glossary for class definitions).
    - Aging or corrosion has affected the integrity of the pipeline.
    - Pipelines have been damaged by the contractor(s) working on behalf of PG&E, resulting in a construction dig-in.
    - Acts of nature have damaged the pipeline.

    In the case of class location changes, PG&E must move or replace the line with stronger pipe to comply with DOT- and CPUC-mandated safety regulations. PG&E uses standard pipeline construction techniques, as described under *G15. New Customer/Business Pipeline Installation.* As the old pipeline is removed from service for the tie-in to the new line, it is blown down (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). Any gas condensation is captured and removed from the old pipeline and disposed of in compliance with current regulatory standards. Existing pipeline is abandoned in place by filling it with slurry before the pipeline is capped. Typically, the crew will cut and cap the pipeline every 1,000 feet, depending on the location. Slurry is used if the pipeline crosses a water body or needs to be stabilized. In the event a pipeline is abandoned in place, PG&E will typically place the new section of pipe as close to the abandoned pipeline as possible and modify any existing easements by expanding the easement width to accommodate the new section of pipeline. In some cases, PG&E may need to acquire new easement rights to accommodate the new pipeline alignment.

PG&E performs pipeline replacement approximately five times per year. The length of pipe affected varies, depending on the reason for replacement. The minimum length of pipe replaced is typically 40 feet (one joint of pipe), although up to 1 mile could be replaced during each replacement effort. A 50- by 50-foot area for new valve equipment is required along each pipeline replacement. Trenching and soil excavation, soil stockpiling, staging, and construction vehicles disturb a 20-foot-wide work area, which includes the 10-foot excavation area. Once the new pipeline is installed, PG&E hydrostatically tests and backfills the pipeline (see *G18. PSEP—Hydrostatic Testing*) and disposes of the water using either a baker tank or sewer. Pipeline replacement can occur at any time of year, depending on operational restrictions related to the need to temporarily shut down the pipeline.

12. G12. Pipeline Telecommunication Site Maintenance: A supervisory control and data acquisition (SCADA) system monitors pipeline functions remotely and transmits pipeline operational information to PG&E's operations offices at the Brentwood Gas Terminal via PG&E's utility telecommunications system. Periodic vehicle or helicopter access is required to check the telecommunication facilities, replace batteries, conduct minor maintenance, or make adjustments to the facilities or components. In the event of major storm damage, reconstruction of the facility or replacement of a component is required as soon as weather permits. A staging area may be required for major maintenance or storm damage repairs. The staging area may be located either next to the site within the temporary work area or at a distant location (for helicopter transport of workers and materials). The pipelines continue to operate during site maintenance.

    PG&E performs this activity approximately once per year. A 20- by 20-foot work area is needed for soil excavation, soil stockpiling, and the use of construction vehicles. Also, approximately once per year, PG&E must install new fiber optic cable, which requires an estimated 10- by 1,500-foot work area.

13. G13. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance

    - Pipeline Right-of-Way Vegetation Management: PG&E manages vegetation along the pipeline ROWs to prevent damage to the natural gas system, facilitate inspections related to routine O&M tasks, and comply with state and federal regulations that require PG&E to patrol periodically for gas leaks. The gas system vegetation management program is designed to eliminate weeds, brush, and trees around equipment and facilities for ROW visibility, fire hazard reduction, security, safety, and maintenance access. Trees and brush that interfere with patrols or tree and brush roots that may pose a threat to buried pipelines may require periodic removal. PG&E also clears any tree canopy and brush that obscures the ROW to facilitate aerial inspections and maintain the line of sight between gas line markers. PG&E's ROW management associated with vegetation management focuses on the need to be able to patrol, inspect, and protect facilities. In the past, PG&E has limited the extent of vegetation management clearing in the ROW to the smallest extent practicable, but future ROW clearing is expected to increase, thereby facilitating long-term future facility patrols and maintenance. To keep incompatible vegetation from growing over the facilities, PG&E does not replant trees within the ROW after vegetation management, although reseeding—with the landowner's notification—is routinely performed.

PG&E identifies areas within the ROW that require vegetation removal during routine patrols. A ROW width averages 20 feet over the gas pipeline. The ROW width is dependent on legal easement documentation and the type of vegetation. For example, some easements are 10 feet wide, and others can be up to 65 feet wide. Vegetation management usually is accomplished by manually removing (with a chainsaw) large-diameter woody vegetation, then mechanically removing other vegetation with a brush hog, hydro-axe, or brush rake, usually to establish a maximum clearance height of 1 foot from the ground (depending on vegetation and the return growth rate), and to allow surveys by foot. If access is poor, vegetation is manually lopped into 6- to 24-inch lengths and scattered within the ROW. PG&E also relies on chemical control (herbicides) for vegetation management. Although herbicides cannot be included as a Covered Activity because of the uncertain impacts of herbicides on endangered species, the following information provides an overview of PG&E's practices.

PG&E uses herbicides in accordance with label requirements and EPA regulations, and are applied by a qualified applicator licensed by the California Department of Food and Agriculture. In general, herbicides are used in the gas transmission ROWs and for cut-stump applications (where PG&E has notified landowner). Only federal and California EPA-registered herbicides are used. These include selective and nonselective, inorganic and organic, contact and translocated, and pre-emergent and post-emergent types. The use of herbicides is subject to landowner notification. PG&E contracts with licensed and registered pest control advisors to prepare herbicide prescriptions for vegetation control and eradication within ROWs.

The Covered Activity described in this section is for those instances in which vegetation management is necessary as a distinct and separate action that PG&E crews perform, and not a part of ROW clearing that may occur for other Covered Activities, such as pipeline replacement. On average, the ROW is reclaimed 10 times per year by removing 10 feet of vegetation on each side of the pipeline over a 0.5-mile length. Ongoing vegetation management of the ROW disturbs a 20-foot-wide corridor averaging 1 mile in length. Frequency is based on an assumed return interval of 5 years within tree- and shrub-dominated land-cover types.

- Access Road Maintenance: Access road maintenance work takes place in the ROW. PG&E maintains the road without altering the road profile. Every 2 to 3 years, PG&E performs surface maintenance on an as-needed basis to keep the access road in operational condition. At approximately five locations a year a temporary turnout that is approximately 45 feet in length and 10 feet wide is needed. If a culvert is replaced during maintenance activities, PG&E would obtain additional required permits (e.g., USACE CWA Section 404 permit).

14. G14. Gas Pressure Limiting Station Construction: Human population densities determine the class location designations of pipelines. A change of class location designation may require PG&E to move or replace a pipeline with thicker pipe to increase safety, as mandated by CPUC (see *G11. Pipeline Replacement*).

    An alternative to replacing the pipeline is installing a pressure limiting station (PLS) that lowers the pressure of the gas in the line. A typical PLS encompasses a footprint area of

approximately 250 by 100 feet, including aboveground pipe and valve structures and a small control/monitoring building (usually 100 square feet) surrounded by security fencing. The control building houses pressure flow monitoring and SCADA equipment. The local distribution system or solar panel-charged batteries provide the electricity for the SCADA equipment.

Installation of a PLS occurs approximately once every 5 years. PLS construction involves excavating a pipeline joint. A construction corridor approximately 100 feet long by 100 feet wide and a laydown area approximately 100 by 100 feet may be required. In addition, the footprint of the PLS is 250 by 100 feet, including fencing. As part of the PLS installation, a portion of the pipeline is blown down. Once the PLS is in place, the pipeline must be hydrostatically tested (see *G18. PSEP—Hydrostatic Testing*).

15. G15. new Customer/Business Pipeline Extension: To serve new residential or commercial customers, PG&E must install new pipelines. Installing new sections of pipeline, up to 2 miles in length, to existing segments involves clearing and grading the ROW, trenching and excavating, pipe placement (including welding, inspection of welds, field-coating or fiber-wrapping, and backfilling), hydrostatic testing, corrosion protection, marking the pipeline, erosion control, and cleanup and restoration. In most terrains, trenching is used to install the pipeline, unless specific circumstances, such as an open crossing of a ravine or a similar small open area, dictate construction of aboveground sections. Specialized trenching and boring methods are used at crossings of rivers, streams, backwaters, washes, faults, roads, railroads, utilities, aqueducts, and canals. The *Work Methods and Techniques* above describes in detail these methods and the other actions involved in new pipeline installation.

    PG&E installs new pipeline extensions approximately once per year. A new 10-foot-wide ROW over the pipeline alignment is required and could be in natural vegetation, city streets, or agricultural settings. Trenching and soil excavation, soil stockpiling, and the use of construction equipment require an approximate 125- by 20-foot work area, which includes the 10-foot excavation area on one side of the alignment. In the event that no access road exists or an emergency arises, it may be necessary to construct a new temporary access road to implement this Covered Activity.

16. G16, 17, and 18. Pipeline Safety Enhancement Program, General: The pipeline safety enhancement program (PSEP) is a multi-year program that will result in the implementation of new gas transmission safety regulations and system improvements designed to meet or exceed new regulatory standards in PG&E's natural gas transmission system. The four main aspects of the PSEP are focused on testing, inspecting, replacing, and automating the gas transmission system. When PSEP is finished, PG&E will have completed a comprehensive assessment of all 5,786 miles of its natural gas transmission pipelines, identified areas of concern, and mitigated risks by replacing pipelines or strength testing them.

    - G16. PSEP - Existing Pipeline Replacement: In general, PSEP involves replacing a targeted pipeline estimated to be 4 to 8 miles long. Replacing an existing pipeline with a new pipeline involves first clearing and grading the ROW, trenching and excavating the existing pipeline alignment, placing the pipe (including welding, inspecting the welds, field-coating or fiber-wrapping, and backfilling), performing hydrostatic testing, protecting pipes against corrosion, marking the pipeline, implementing erosion control measures, stockpiling spoil in the ROW, removing or

abandoning existing line, and cleaning up and restoring the ROW. In general, the existing pipeline will be abandoned in place and filled with slurry and capped, although some of the pipelines will be removed and restored. PG&E may need to acquire additional ROW to accommodate an increase in the pipeline corridor for about 75percent of the new pipeline.

PG&E will replace approximately 248 miles of pipeline over an 8-year period. Of the 248 miles, approximately 75 percent (186 miles) are in urban areas and will cause no disturbance to natural or agricultural land-cover types. The remaining 62 miles are in non-urban areas. PG&E will replace an estimated 7.75 miles of pipeline in non-urban areas in each of the 8 years. A new 10-foot-wide ROW above the pipeline alignment is required and could be in natural vegetation. Trenching and soil excavation, soil stockpiling, staging, and the use of construction vehicles require a work area, which includes the 10-foot-wide excavation area along the length of the pipeline.

PG&E may perform PSEP pipeline replacement at any time of year, depending on operational restrictions related to the need to temporarily shut down the pipeline. In the event that no access road exists or an emergency arises, construction of a temporary road that is estimated at 0.5-mile in length by 12 feet wide may be necessary to implement this Covered Activity.

- G17. PSEP – Valve Replacement or Automation: Mainline valves, which regulate the flow of gas through the pipeline and enable crews to isolate portions of pipeline, occasionally malfunction or wear out, causing leaks. PG&E also replaces valves to allow for the passage of inspecting devices (i.e., pigging for in-line inspections). PG&E replaces faulty valves for operational and public safety reasons. To ensure overall pipeline system safety, within the next 8 years PG&E will be automating approximately 120 existing valves and, when automation is not possible, replacing approximately 64 valves. Enhancing or replacing approximately eight of the valves per year may include an aboveground valve, several small cabinets for a SCADA system, and electric service extension. Mainline valves are generally 7 to 20 miles apart.

  Prior to replacing or installing valves, a portion of the gas line must be blown down. Valve replacement occurs within the existing station facility corridor. If PG&E replaces a small section of the pipeline during valve placement or automation, the pipeline must be hydrostatically tested (see *G18. PSEP—Hydrostatic Testing*). PG&E may replace or automate values at any time, depending on weather and on operational restrictions related to the need to temporarily shut down the pipeline.

  Disturbance areas account for the anticipated need for facility upgrades and fencing of 10 percent of the valves, which expands the footprint to a 50- by 50-foot facility. Soil excavation, soil stockpiling, and the use of construction vehicles require an approximate 150- by 150-foot work area. A 50- by 50-foot laydown area to store equipment may also be required.

- G18. PSEP – Hydrostatic Testing: To ensure pipeline integrity, PG&E is hydrostatically testing all pipeline segments without a hydrostatic test on file as part of PSEP. Since 1970, all new pipeline segments are required to be hydrostatically

tested and recorded. Testing complies with requirements of CPUC, California Department of Transportation (Caltrans), Regional Water Quality Control Boards, and Cal/OSHA. PG&E typically conducts testing before backfilling the underground pipeline and estimates that it will hydrostatically test 100 segments of pipeline by 2020. PG&E most commonly uses water as the test medium, but compressed air or compressed nitrogen gas occasionally are used for testing small-diameter pipes. Testing pressure and duration are determined by pipe size, pipe specifications, pipe-wall thickness, and elevation. Prefabricated test heads are installed on the section of line to be tested. The section is then filled with water from an available source, such as a fire hydrant. Water can also be transported to the site by water trucks or sent through temporary aboveground water lines. Once the pipeline is filled, a hydrostatic pump is used to increase the internal pressure to the designed test pressure, typically 1.5 times the system's maximum operating pressure. The amount of water used in a hydrostatic test depends on the diameter and length of pipe tested.

Upon successful completion of the hydrostatic test, pressure is reduced, and the water is expelled from the pipeline using air compressors and a cylindrical foam pig. PG&E discharges only clean water, and the water is not released under pressure. PG&E obtains any necessary water quality permits, expels and disposes of test water in a manner consistent with local water quality considerations, and implements its water quality BMPs when disposing of test water. Because most of the testing will be conducted in urban areas, PG&E is anticipating it will be able to discharge water to baker tanks or sewers. If baker tanks or sewer systems are not feasible when working in natural vegetation areas, crews would lay temporary plastic or rubber pipe to discharge the test water to less sensitive natural areas or agricultural land. Each segment of pipeline is approximately 2 to 4 miles in length; approximately 60 of those segments are in urban areas where no impacts on natural vegetation would result. The remaining 40 tests would be in non-urban areas at a rate of five per year over an 8-year period. Soil excavation, soil stockpiling, and the use of construction equipment at each end of the pipeline requires an approximate 20- by 50-foot work area. An additional 100- by 100-foot laydown area and a staging area are also required at each end of the pipeline. Hydrostatically tested pipelines may require a 100- by 100-foot staging area to store the baker tank(s).

C. Activities Similar Across Multiple Electric System Projects

Items 1-9 below are general descriptions of the methods PG&E uses for access, staging, clearing, grading, erosion control, trenching and excavating, and crossings that are similar across all the individual categories of Covered Activities under the Electric System Line of Business.

1. Access: Access to electric and gas facilities is similar in that PG&E uses existing public and private roads to access the ROW to the maximum extent possible. However, because the length of electric facilities is greater than that of gas facilities, and because electric facilities are more frequent in remote areas, PG&E must construct new temporary access roads periodically when access to the site is not readily available. While the exact location of all temporary roads cannot be determined at this time, the HCP includes measures designed to site roads to minimize impacts on Covered Species and their habitats using the AMMs described in Chapter 5, Conservation Strategy. PG&E constructs these roads within a

minimum footprint area and ultimately decommissions and restores them to preconstruction conditions at the completion of the activity. In some instances, however, roads may be left in place to provide site access for annual patrols or inspections. The Covered Activity descriptions below include discussion of construction of permanent and temporary access roads, as appropriate.

2. Staging: A staging area is typically required for large-scale Covered Activities, such as transmission line reconductoring. Staging for the Electric System is similar to that for the Natural Gas Line of Business. See section A. 2 above for additional information. Also, the individual categories of Covered Activities below in section D discuss the sizes of the staging areas.

3. Clearing: Activities involving clearing, when necessary, conform to landowner agreements or permits issued by regulatory and land management agencies. Clearing for electric facilities begins by staking the construction ROW. Maintenance personnel then clear vegetation, remove obstacles, and grade to the extent necessary to allow safe work practices and access. In the event that minor clearing of privately owned commercial tree species (i.e., orchards) is necessary, construction personnel move and stack the trees in accordance with the landowner's preference. Stump profiles are left as low as required for safe work practices and access. Stumps may be removed where appropriate. Debris generated during clearing of the ROW is either chipped and left onsite or disposed of appropriately. In some instances, PG&E's easement documents dictate the methods for disposal.

4. Grading: PG&E performs grading to allow for safe work practices and access and to ensure the proper installation of electric facilities. PG&E also conducts grading to maintain the structural integrity of an electric facility that is being affected by soil movement. On steep terrain where the ROW must be two-toned, PG&E restores the areas after construction to approximate preconstruction topographic contours.

   PG&E segregates topsoil from subsoil and windrows the topsoil near the site to preserve topsoil. Surface rocks, if present and useful for reclamation, are set aside. PG&E collects unused rocks and hauls them offsite to a landfill. PG&E restores graded areas after construction to approximate preconstruction topographic contours where possible and, if the impact area is greater than 0.1 acre, PG&E revegetates the impact area. The construction footprint calculations include areas potentially affected by grading.

   Sometimes PG&E temporarily installs prefabricated bridges or culverts in the ROW or in access roads to ensure safe access and reduce environmental impacts in accordance with state and federal regulations. If the bridge is only needed for a few hours, then a portable bridge is pieced together onsite and secured with a crane to span the crossing. If a longer term crossing is required, then PG&E installs a culvert after obtaining the requisite permits from the regulatory agencies.

5. Erosion Control: As it does for gas facilities, PG&E considers various types of erosion control and implements applicable methods and/or measures identified in the California Stormwater Best Management Practices Handbook (California Stormwater Quality Association 2014) for electric transmission and distribution facilities. Erosion control techniques are employed to preclude impacts on towers and poles resulting from soil movement, gully development, and sedimentation of local drainages. PG&E uses standard

erosion control measures that may include grading; installation of water bars along temporary or dirt roads, diversion channels, and terraces to reduce erosion and runoff; ditch plugs installed in ditches to prevent washout; riprap to repair or maintain bank stability; and other soil stabilization practices such as jute mats, wood mulching, straw mulch, and other methods described in the handbook. The methods PG&E chooses depend on the situation and the condition of the site. Most erosion control work is small and contained within work sites. Larger erosion control efforts to repair or maintain bank stability, for example, are conducted on an infrequent, as-needed, basis. This work typically involves more extensive planning and permitting to gain the necessary approvals from relevant agencies. PG&E infrequently uses riprap in the Bay Area—on less than 100 linear feet of streams each year—and only if other biomechanical methods cannot be used or when making repairs to existing riprap structures. PG&E does not undertake vegetation removal, grading, or substantial alteration of drainage conditions when performing erosion control work.

6. Trenching and Excavating: The process of excavating the underground electric line trench varies according to location, soil type, and terrain. PG&E conducts trenching and excavating in accordance with Cal/OSHA requirements for employee and public safety; see section A 6 above for additional information on trenching and excavating.

7. Crossings: Boring and open trenching are typical construction methods for crossings of underground electric line construction. PG&E typically uses boring when crossing active waterways, railroads, and major roadways. The three most common boring methods are jack-and-bore, horizontal directional drilling, and microtunneling; see section A 7 above for additional information on crossings.

8. Cleanup and Restoration: The final phase of large Covered Activities such as underground line construction involves cleanup and restoration of the ROW. The goal of restoration is to achieve compatibility with pre-existing vegetative conditions, in accordance with standard procedures approved by federal and state regulatory authorities. PG&E removes construction material and re-contours disturbed areas to their pre-project grade. Depending on the nature of the site and the type of installation that took place, several tasks may be involved in the cleanup and restoration.

9. Vegetation Management: Vegetation interference with electric lines is one of the most common causes of electric outages throughout the United States. Electric outages may occur when trees or tree limbs grow, fall, or in other ways make contact with electric lines. Outages may also occur when electric lines sag into vegetation below the lines because of increased load or ambient air conditions (i.e., high air temperature or wind). Vegetation that may come into contact with electric lines can also start fires. PG&E has more than 3,000 vegetation-related outages throughout its service area per year, and each of these outages has the potential to be a fire ignition point. Specifically, vegetation management refers to maintaining the electric system in working order, which requires a specific clearance distance from the line. PG&E routinely performs activities to ensure the safe and reliable operation of electric distribution and transmission facilities. Vegetation management activities are required for maintenance of the electric system, which includes lines and utility structures such as poles and boxes.

   When pruning vegetation, there must be enough clearance to ensure that the pruned vegetation does not grow back into the electric lines before the vegetation maintenance

crews inspect the line on the next cycle. Pruning prescriptions depend on the location of the vegetation in relation to the line. If the vegetation is located adjacent to the line, limbs can be pruned along one side of a tree (i.e., side pruning). Vegetation growing under the lines is often topped (i.e., its height is reduced) at the required height below the conductors. Vegetation management is only implemented for those trees and shrubs that will interfere with the electric line when at a mature height or when North American Electric Reliability Corporation (NERC) requirements specify different prescriptions. With few exceptions, such as in the case of pole clearing, any low-growing species are left untouched because they will never pose a risk to the safety or reliability of the electric line. NERC requires clearing at subject poles to remove any vegetation that could propagate a fire.

The vegetation management program operates under the following regulatory requirements.

- NERC Standard Facilities Design, Connections, and Maintenance (FAC)-003-2. Addresses the requirements to improve the reliability of the electric transmission system by preventing vegetation-related outages that could lead to cascading on critical electric lines operated at 200 kV or higher.
- Public Resource Code 4292. Addresses poles and towers with specific types of equipment (subject poles) on distribution and transmission overhead electric facilities in State Responsibility Areas (SRAs) and some select Local Responsibility Areas (LRAs) during fire season.
- Public Resource Code 4293. Addresses primary distribution and transmission overhead electric conductors in SRAs during fire season.
- CPUC General Order 95, Rule 35. Addresses requirements for all primary and secondary distribution and transmission overhead electric conductors.
- CPUC General Order 95, Rules 37 and 43: Address the construction design (minimum ground-to-conductor clearances) of overhead electric facilities, and temperature and maximum electric loads, both of which effect maximum sag of the electric lines.
- NERC Standard FAC-003-01. Addresses all NERC-regulated overhead transmission electric lines.
- California Independent System Operator (CAISO) Transmission Maintenance Agreement. Addresses all transmission overhead electric facilities.

These regulations require line clearances, as shown in HCP Table 3-1 (page 27 of this opinion), included for reference below.

HCP Table 3-1. Line Clearance Requirements by Regulation and Facility Voltage

	Voltage					
Regulation	Less than 4 kV	4 kV–21 kV	60 kV/70 kV	115 kV	230 kV	500 kV
CPUC General Order 95, Rule 35	No strain or abrasion	18 inches and hazard trees	1.5 feet and hazard trees	1.6 feet and hazard trees	2.6 feet and hazard trees	10 feet and hazard trees
Public Resource Code 4292	10 feet	10 feet	10 feet	10 feet	10 feet	10 feet
Public Resource Code 4293	NS	4 feet and hazard trees	4 feet and hazard trees	10 feet and hazard trees	10 feet and hazard trees	10 feet and hazard trees
PG&E Minimum Clearance Distance	No strain or abrasion	18 inches LRA, 4 feet SRA and hazard trees	4 feet and hazard trees	10 feet and hazard trees	10 feet and hazard trees	20 feet and hazard trees
CAISO Transmission Maintenance Agreement	NS	NS	NS	NS	NS	NS
NERC FAC-003-01	NS	NS	NS	NS	NS	NS
NERC FAC-003-02	NS	NS	0.82 feet	1.41 feet at sea level	3.49 feet at 3,000 feet elev.	5.66 feet at 3,000 feet elev.

Note: NS – No Standard

Rules 37 and 43 are not included in the table because Rule 37 allows modifications to values set in Rule 35, and Rule 43 provides safety loading guidance.

The regulatory clearance distances shown above are minimums. Actual prescribed clearance distances are greater to account for tree growth and movement, as well as sag and blow-out distances. An example is that under the CAISO Transmission Maintenance Agreement and NERC FAC-003-01 guidelines, PG&E implements a minimum clearance of 20 feet. *Sag* is the additional distance a line can sag toward the ground when it is carrying an electric load during a hot weather. *Blow-out* is the additional distance a line can swing side to side under windy conditions. These distances are provided in HCP Table 3-2, included for reference below.

HCP Table 3-2. Estimated Sag and Blow-Out Distances Used to Support Transmission Line Clearance Prescriptions

	Span Length (feet)						
Span Segment	200	400	600	800	1,000	1,500	2,000
Sag distance (feet)							
Quarter span	3	5	8	9	11	12	13
Mid-span	4	7	10	12	14	16	17
Blow-out distance (feet)							
Quarter span	0	1	3	5	9	20	36
Mid-span	0	2	4	7	12	27	48

D. Electric System

PG&E acquires a diverse mix of electric power generation from hydroelectric, nuclear, natural gas, solar, wind, and geothermal sources from over 400 plants owned by independent power producers or qualified facilities for resale to its customers. PG&E's role in, and responsibilities related to, the transmission and distribution of electric energy is not anticipated to change. Electric energy is carried over the bulk electric grid, a "network" of high-voltage transmission lines that transport power from power plants to switching stations or substations, where power is redirected and transformed to lower voltages. PG&E substations are critical junctions and switching points in the electric system, connecting the transmission system to the distribution system. Substations use transformers to lower the voltage of electric energy before it is sent to the distribution lines and on to customers. The distribution system includes main or "primary" lines and lower voltage or "secondary" lines, which deliver electric energy either overhead or underground; distribution transformers, which lower voltage to usage levels; and switching equipment to permit the lines to be connected together in various combinations and patterns. Individual services then connect the distribution system to the customer. The transmission lines operate at 500, 230, 115, 70, or 60 kilovolts (kV) and may be constructed on steel towers, steel poles, or wooden poles. The switching stations and substations transform the electric energy down to 21 or 12 kV for the distribution system. The distribution lines are installed either underground or on the overhead wooden poles typically found along highways and streets. Pole-mounted transformers further reduce the voltage to 110/220 volts for normal household use. In the Bay Area, PG&E owns, operates and maintains approximately 4,430 miles of transmission lines, 23,015 miles of distribution lines, and 207 substations. PG&E's electric system consists of a transmission system and a distribution system. The electric transmission system in the Plan Area consists of approximately 4,430 miles of transmission lines. Bulk transmission lines (230 kV and 500 kV) are supported on steel-lattice towers or steel poles. Power lines with a 60 kV, 70 kV, or 115 kV capacity are most often supported by wood poles, but steel poles, tubular steel poles, and lattice towers are also used in certain areas throughout the HCP Plan Area.

PG&E operates 207 transmission substations in the Plan Area. Power from high-voltage transmission lines is transformed to lower voltage at these substations. The in-line spacing of these structures varies. The height of conductors above the ground also varies according to topography and the design of the transmission system. Generally, conductors on 230 kV and 500 kV systems are designed to maintain a minimum clearance of 30 feet above the ground. CPUC General Order (G.O.) 95 dictates the design of electric facilities. Conductor sag varies and is configured on the basis of the towers/poles, the electric load, ambient air temperature, conductor type, and span length. Transmission ROWs are of varying widths and generally are within easements that are negotiated with private landowners or the holders of public lands. PG&E owns fewer than 1 percent of these ROWs in fee title; the rest are in easements. The widths depend on system voltage, the number of lines per ROW, terrain, and other factors. The electric transmission system includes a network of fiber optic communications cable associated with the SCADA system. In addition, there may be cables owned by other entities located inside the PG&E ROW that the Bay Area O&M HCP does not cover. For example, fiber optic communications cable is typically installed on transmission structures with clamping apparatus, either above or below the transmission circuits.

PG&E's electric distribution system provides links between most customers and the transmission system. Approximately 14,885 miles of overhead distribution lines extend through the Plan Area, and another 8,130 miles are underground. Wood or steel poles support the distribution conductors. The electric distribution ROW widths vary according to the system voltage, terrain, and other

factors. The distribution system includes primary and secondary distribution lines that deliver electricity and distribution transformers that reduce voltage from distribution to utilization levels. Primary distribution lines carry three-phase AC power in the 2 to 50 kV range to street rail and bus systems as well as to industrial and commercial customers. Secondary distribution lines serve most residential customers with 120-/240-volt, single-phase, three-wire service, which provides electric power for most appliances. Secondary distribution transformers can further reduce voltage to the required secondary voltage at or near a customer's service connection.

Insulators are positioned between support structures and conductors to support the wires and isolate energized conductors from potential grounding. Most insulators for transmission voltages are ceramic; however, non-ceramic insulators made of fiberglass rods and rubber shrouds also are used.

Items 1-15 below are descriptions of categories of Covered Activities associated with the individual categories of Covered Activities for the Electrical System Line of Business.

1. E1. Patrols:

    - Aerial Patrol: PG&E conducts aerial patrols of electric transmission lines, distribution lines, and associated facilities annually (in terms of calendar years) using helicopters only.

    - Ground Patrol: If electric transmission lines and associated facilities are located in no-fly zones, PG&E personnel conduct ground patrols on foot or with ATVs, or use small trucks or SUVs on existing access roads. These patrols occur on a 2- to 5-year cycle, depending on whether the facility is wood or steel. Vegetation management personnel conduct annual ground patrols of transmission and distribution lines by vehicle and on foot. It is estimated that 33.3 percent (7,664 miles) of the electric distribution system and 87.5 percent (3,876 miles) of the transmission system is patrolled each year. Approximately 95 percent of the patrolled system length is accessible from existing roads. The rest is patrolled on foot or by use of a helicopter. Approximately 5 percent (577 miles) of the electric system requires access by offroad travel using light trucks or ATVs.

2. E2. Inspections:

    - Tower, Pole, and Equipment Inspection: PG&E routinely inspects tower footings and poles to verify stability, structural integrity, and equipment condition (e.g., fuses, breakers, relays, cutouts, switches, transformers, paint). Footings and poles are accessed from existing roads or may require off-road travel, either in vehicles or on foot.

    - Outage Inspection: When outages and CPUC Reportable Incidents occur because of weather, accidents, equipment failure, or other reasons, PG&E inspects lines to determine the location and probable cause of the outage. Lines are accessed from existing roads or may require offroad travel, either in vehicles or on foot.

    - Substation Inspection: PG&E inspects all transmission and distribution substations every 1–2 months to verify equipment operation and conduct safety inspections. Substations are accessed from existing roads in vehicles.

- Telecommunication Sites: PG&E conducts routine inspections of telecommunication sites annually unless problems are identified at specific sites. Access is by light truck on existing access and power line ROW roads or by helicopter. Helicopter patrols are infrequent, and hovering typically lasts only a few minutes, allowing personnel to collect a GPS point for the site or note the facility location.

- Sections of Line: The regular inspection of underground facilities, instrumentation and control, and support systems is critical for safe, efficient, and economical operation. PG&E inspects aboveground components at least annually for corrosion, equipment misalignment, loose fittings, and other common mechanical problems. The underground portion of the line is inspected at vault locations annually. Inspections are performed from existing roads or may require offroad travel, either in vehicles or on foot.

- Land Surveys: When new construction is proposed by a property or land developer, PG&E conducts land surveys of facilities and facility ROWs for construction layouts and other purposes. Data collected include precision measurements regarding length and slope and other geology-related information. Access is by vehicles on existing roads but may include offroad travel or surveys on foot.

3. E3. Insulator Washing or Replacement: Conductive airborne particles or bird droppings that settle on ceramic insulators can provide a path across the insulators, causing contamination-induced electric faults. PG&E personnel periodically wash ceramic insulators to reduce the risk of such faults. Nonceramic insulators tend to perform better in contamination-prone areas. Insulators are washed periodically to prevent faults using a truck- or trailer-mounted spray system or a helicopter. Washing typically is done during energized conditions (i.e., while the power lines are operating). Distilled water is used to wash the insulators; dry washing using ground corn hulls also is used.

   PG&E replaces insulators when they have been damaged by gunshot, lightning, or heavy corrosion or when they no longer can be washed. They can be replaced while energized or de-energized, depending on access, loading, and safety. Replacement typically takes a four- to six-person crew with a small truck for hauling crewmembers, tools, and materials. If access is limited, a helicopter may be used to land crewmembers and tools on a tower. Insulators are washed or replaced approximately once annually.

4. E4. Substation Maintenance: Most of PG&E's substations are located near load centers, such as residential, commercial, and industrial areas. Typical minor maintenance tasks at these substations include repair and replacement of transformers, switches, fuses, cutouts, meters, and insulators. Maintenance of substation systems requires this type of work approximately once per year. Load demands may require modifications of station equipment or installation of new facilities. These Covered Activities could require use of station property or adjacent property for construction staging, materials storage, permanent facilities, and land management.

   PG&E conducts vegetation management inside and outside of substation facilities as required to meet CPUC and local regulations and ordinances, reduce and eliminate fire hazards, enhance security for fenced facilities, enhance aesthetics, and reduce potential for

illegal dumping and homeless encampments. Covered Activities on PG&E lands to control vegetation external to substations may include the mowing of grass and weeds. Treatments include prescribed applications of appropriate herbicides, both pre-emergent and post-emergent, and pruning or removal of vegetation where needed inside or on the immediate perimeter of a fenced facility (usually within 3 to 5 feet of the fence).

Occasionally, public agencies, municipalities, or neighboring landowners ask PG&E to conduct additional special projects on PG&E parcels outside of the fenced facility, usually for the purpose of fuel reduction to maintain compliance with local and state fire codes. These projects, aimed at managing fire risk or public nuisances, may include brush and weed mowing and discing, herbicide treatments, tree thinning or pruning, and trash removal. Workers may use tractors, flail mowers, or string trimmers for mowing and discing operations. Tree service crews use chainsaws to manually prune or remove hazard trees and to cut brush. Herbicides may be applied, when appropriate, by use of vehicle-mounted spray equipment on tractors, ATVs, and pickups, or manually applied by backpack sprayer. Herbicide applications on special projects are prescribed by a California Licensed Pest Control Adviser and may include pre-emergent, directed post-emergent, and cut stump treatments. Substations are located primarily in residential, commercial, and industrial areas. No impacts on natural vegetation would result within the fenced perimeters during maintenance because the grounds are blacktopped or graveled. An estimated 150 acres of PG&E property external to fenced substation perimeters is disced, mowed, or cleared of vegetation annually and is part of the baseline condition for sites that have been maintained annually. It is estimated that one of these substations has adjacent sensitive habitat, resulting in a 20-foot by 1,000-foot disturbance area.

5. E5. System Outage Repair: Covered Activities involving outage repair are necessary to maintain the level of public safety the CPUC requires. Weather, equipment failure, accidents, fire, or bird electrocution are typical causes of outages. When an outage is reported, PG&E patrols the line until personnel determine the cause of the outage. Access is primarily on existing roads, although some overland access with small trucks or SUVs is expected. Depending on the cause of the outage, repair may entail anything from reclosing a switch to replacing a transformer or pole. Crews repair and restore circuits as quickly as possible.

   PG&E performs outage repair approximately 500 times per year in rural locations throughout the Plan Area. Soil excavation, soil stockpiling, and the use of construction equipment disturb an approximate 22-foot by 22-foot work area during each repair.

6. E6. Tower and Boardwalk Replacement or Repair:

   - Tower Replacement or Repair (E6a): PG&E tower replacement or repair typically involves tower extensions or strengthening the foundations or superstructures of towers. Superstructures typically are strengthened by replacement, modification, or the addition of pieces of steel lattice, as determined by engineering analysis specific to each tower.

   - Tower Extensions: The most common method to raise a tower involves installing a prefabricated extension at the bottom, waist, or top of the tower. The extension is typically installed using a helicopter or crane depending on the tower location. If a crane is used, an approximately 25-foot by 40-foot area is graded adjacent to the

tower to serve as a level crane pad. This occurs approximately 360 times annually. Temporary wood pole supports (shoo-flies) are constructed adjacent to the tower to support the conductors while the crane lifts the tower. The tower extension is installed, the conductors replaced, and the shoo-flies removed.

The second method requires lifting the tower. A tower lifter is driven beneath the tower, and its four arms are clamped to the tower legs. The tower legs are unbolted from the base, the tower is lifted, and leg extensions are installed.

- Strengthening Tower Foundations: To strengthen tower foundations, concrete from the existing footings is broken away to expose the steel reinforcements. A new replacement concrete footing, called a grade beam, is poured between reinforcements. When the towers are accessible from existing roads, the old concrete footings are removed and hauled offsite on large trucks. For some project locations the old concrete footings are bagged in a giant tarp with ropes and bundled and taken by helicopter from the tower site and disposed of according to regulations, typically at a local landfill. To repair foundations submerged in water, such as in the San Francisco Bay, a cofferdam is installed at low tide to allow access to the foundation footing. The wood cofferdam is built around the footing to be repaired and is used to isolate the footing from the water. The mud is removed by hand, and the dam is pushed down to the required depth to expose the solid piling, usually 3 feet below the mud line. Typically the mud is placed in bags and taken to a landfill. If there is little mud collected, then it is returned to the base of the footing after the cement is poured. The material is staged by helicopter or barge, or a combination of both. The old concrete pier is chipped away to expose the pile. New pins are inserted, a new rebar cage is installed around the pile, and the concrete is replaced. The cofferdam then is removed by excavating around the outside and hoisting it from the tower.

  Where PG&E cannot complete the work from an existing boardwalk, construction crews place a rubber mat at the base of each footing as a work area. If a lot of material is needed at the job site, PG&E builds a temporary section of boardwalk laterally from the existing boardwalk. A helicopter is then used to place the material on the temporary boardwalk, and workers move the material to the work site by hand or wheelbarrow.

  If piles are not required for the tower foundation, footing repairs can be done within a work area extending approximately 2 feet from the footing. If piles are required, the work area may need to be extended to 20 feet outside the tower footprint. For a couple of hours, PG&E crews may use rubber mats to temporarily access the area requiring maintenance work. Workers place the mats in such a way to help protect the vegetation around the temporary boardwalk during its construction.

- Strengthening Tower Superstructures: Superstructures typically are strengthened by replacement, modification, or addition of pieces of steel lattice, as determined by engineering analysis specific to each tower. Other minor repairs that require accessing facilities are replacing fuses, breakers, relays, cutouts, switches, transformers, and paint.

- Access Boardwalk Repair and Replacement (E6b): PG&E has many miles of boardwalks that service transmission facilities in the vegetated margins of the San Francisco Bay. The boardwalks typically extend from levees and provide access across marsh and salt ponds to transmission tower footings. These boardwalks have a 15- to 20-year life and require repair and replacement. Approximately 15 times per year, 1,500 feet of boardwalk are repaired or replaced, which consists of installing replacement piles (spaced approximately 100 feet apart) and replacement planks. PG&E crews perform boardwalk maintenance and construction activities using hand tools and gas-powered tools such as drills and saws. Replacement piles are pushed into the ground using a steel bar for leverage and the weight of four people. The planking is transported along the boardwalk on special hand-dollies. Planking is slid into place, drilled, and bolted. If the boardwalk is not too degraded (i.e., still walkable), crews do much of the work from the boardwalk, and some from adjacent to the boardwalk. where piles are being replaced. If PG&E is raising the height of an existing boardwalk, crews do the work from the boardwalk. If the boardwalk is substantially degraded, crews do the work within a 10-foot corridor around the boardwalk being replaced. When a 10-foot by 10-foot work area is required, soil excavation and soil stockpiling disturb vegetation.

7. E7. Facility Installations (Shoo-Flies): PG&E needs to replace or repair poles/towers and equipment (e.g., anchors, cross arms, insulators, wires, cables, guys, switches) when they fail or become unsafe. New additions to existing transmission line facilities or tap lines from the old facilities may require installation of a shoo-fly.

   Shoo-fly installations involve adding temporary poles or structures around existing permanent facilities to limit service interruptions until work crews can make permanent repairs. Shoo-flies consist of a number of poles and anchors supporting conductors to bypass facilities needing repairs or upgrades. In some cases, existing conductors can be removed from the old poles or structures and reattached to the shoo-fly structures. In most cases, this can be accomplished with one or two poles for every circuit attached to the structure being shoo-flied. For example, one double-circuit 115 kV tower (six wires attached) would require a minimum installation of four poles. Shoo-fly supports are removed when the repair or construction work is complete. The section titled *Tower and Boardwalk Replacement or Repair* discusses Covered Activities requiring shoo-flies. Shoo-fly installations occur approximately 100 times per year. A work area of approximately 25 by 100 feet is frequently required.

8. E8. Pole Replacement:

   - Pole Equipment Repair and Replacement (E8a): PG&E must repair or replace pole equipment (e.g., cross arms, insulators, pins, transformers, wires, cables, guys, anchors, switches, fuses, and paint) when it fails, becomes unsafe, outlasts its usefulness, or is identified for replacement. Replacement and repair of pole equipment typically are performed with the pole in place, using a line truck. Such repairs and replacements take place approximately 500 times per year.

   - Utility/Wood Pole Replacement (E8b): When replacing a PG&E distribution or transmission pole is warranted, the new pole is framed (i.e., cross arms, pins, insulators, grounds, bonding, markers, and any equipment are installed) on the

ground adjacent to the existing pole prior to setting the pole in the ground. To replace a pole, the line is typically de-energized. A line truck augers a hole, the new pole is moved into the new hole, the conductors are moved from the old pole to the new pole, the old pole is typically removed, and the old pole site is backfilled with the augured soil. Existing wood poles may be replaced with new wood poles or light-duty steel poles. PG&E pole replacements take place approximately 500 times per year, requiring a 10-foot-long by 7-foot-wide work area.

9. E9. Line Reconductoring: PG&E needs to replace conductors (wires) once the wires have outlasted their usefulness. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (pulleys) attached to the arms of the towers or pole cross arms. Travelers are installed at each tower or pole using a boom truck. Where a boom truck cannot be used, a winch is used to install the travelers. In some cases, a helicopter is necessary to install the travelers and conductors.

   Reconductoring typically is done in 2- to 3-mile sections with the use of pull and tension sites ("pull sites"). Pull sites are temporary construction areas that are used during the removal of existing conductors and the placement of new conductors along the transmission line. Pull sites may also be used to stage materials and provide work areas for tower or pole work. Pull sites are typically located within relatively flat areas that are in line with the conductor. Several pieces of equipment are used at the pull sites, including tensioners (rope trucks) to feed out the new conductor and adjust tension, conductor reels to receive the existing conductor as it is removed, and reels of new conductors. Trailers pulled by semi-trucks, which also are parked onsite, typically deliver and remove the reels. Onsite cranes move the conductor reels on and off of the semi-trucks.

   The pull sites are generally rectangular and vary in size, from approximately 50 to 350 feet wide for small pull sites and approximately 100 to 1,250 feet long for large pull sites. The distances between pull sites vary, but on average, approximately 2.7 miles of conductor separates single pull sites or groups of pull sites. Vegetation mowing and minor grading may be required to prepare some pull sites for use.

   Before pulling the conductor, PG&E crews install clearance structures at road crossings and other locations (where necessary) to prevent conductors from contacting existing electric or communication facilities or passing vehicles. These temporary structures consist of wood poles and, occasionally, a support net stretched beneath the conductors.
   After the conductors are pulled into place, they are tensioned by pulling them to a predetermined sag and tension. The conductors are then permanently attached to the insulators and existing conductors.

   Electric distribution reconductoring takes place approximately 250 times a year, and electric transmission reconductoring takes place approximately 10 times a year. One-third of all reconductoring work requires a pull site; the remaining reconductoring work requires installation and removal of travelers on a two-circuit line, resulting in disturbance. Electric transmission reconductoring also requires in a 25-foot by 25-foot work area.

10. E10. Vegetation Management: PG&E performs routine vegetation management on all of its overhead electric distribution and transmission facilities to maintain compliance with Public

Resource Code Section 4293, CPUC G.O. 95 and Rule 35, the CAISO Transmission Maintenance Agreement, and NERC's FAC-003-01 and 02. PG&E's electric vegetation management team makes informed decisions regarding tree removal versus tree pruning based on a variety of considerations, including: (1) regulatory requirements—what is needed to comply with current standards and guidelines; (2) facility protection objectives—what is needed to best protect the facilities; (3) tree health—will required clearance distances affect tree health; (4) economics—what are the costs and benefits of pruning versus removing; (5) property owner notification—does the property owner object to removal; (6) land rights—does PG&E have the land rights to support removal; and (7) environmental considerations—are there species, habitat, erosion, or other environmental issues to consider.

In addition, PG&E performs work focused specifically on outage prevention to provide reliable electric service and reduce the risk of fires. The clearance regulations identify, by voltage, specific clearance distances that PG&E must maintain between vegetation and energized conductors. Minimum clearance distances range from 18 inches to 20 feet. Vegetation removals for routine maintenance and reliability work generally involve individual trees or small groups of trees encompassing less than 0.1 acre (66 by 66 square feet) per event on an annual basis.

Additional information on vegetation management's environmental screening process and best management practices is provided in Chapter 5, Conservation Strategy.

- Routine Maintenance (E10a): Routine vegetation management includes an annual patrol of vegetation growing near overhead distribution and transmission facilities. It also includes pruning or removal of trees that will not remain outside of required clearance distances or that may pose a hazard to electric facilities before the next year's patrol. Approximately 80 percent of the routine maintenance is pruning the trees to a clearance level dependent on voltage and regulations, and approximately 20 percent is removal of small in-growth or hazard trees. It is estimated that 20 hazard trees are removed annually.

  The E10a category also includes Public Safety and Reliability Maintenance, which focuses on tree work outside of the minimum clearance distances on distribution line sections that have a history of high numbers of tree-related outages. This activity effects larger portions of the tree than other routine vegetation maintenance work. The goal of this work is to increase public safety and reliability by reducing the number of outages by preventing power line contacts from tree or branch failures. PG&E prioritizes the distribution line sections that have the worst performance, as measured by either a high number of customers who have been without power or a high number of repeat outages. Once a line section is prioritized, personnel analyze the outage data to determine the pattern of tree failure that has historically caused vegetation-related outages and a vegetation-specific management prescription is written for trees along those line sections. For example, if the outage history shows that redwood limbs typically cause outages during storms, the prescription would be to identify and remove redwood limbs that overhang the electric line. If the outage history shows that bay trees have a history of blowing over during storms and causing outages, then the prescription would identify bay trees that may blow over and call for their removal.

- Pole Clearing (E10b): PG&E performs pole clearing around subject poles on its overhead distribution and transmission facilities to maintain compliance with Public Resource Code Section 4292. There are two subcategories of pole clearing: maintenance of previously cleared poles and maintenance of poles that have never been cleared of vegetation. Both subcategories occur annually. Vegetation clearing for existing poles applies to vegetation that has grown over the course of the year (i.e., grasses, forbs, saplings, and branches). Vegetation clearing for new poles requires the removal of all vegetation within 10 feet of a pole that could propagate a fire. Vegetation management includes annual patrol of overhead facilities, removal of material capable of propagating a fire, and—with property owner notification—chemical treatment with herbicides to prevent regrowth. In some cases, because of vegetation regrowth, it is necessary to clear a pole more than once during a given season. Approximately 100 poles are cleared of vegetation in a 10-foot radius around the pole annually in natural vegetation.

- Tree Removal — Small Groups (E10c): When appropriate—considering tree species, growth rates, site conditions, landowner notification, and appropriate permits—PG&E removes small groups of trees growing below overhead transmission and distribution facilities while conducting routine maintenance activities (E10a). Trees are removed in groups affecting 0.1 acre (4,350 square feet) at approximately 25 locations each year, two to three of which could be in riparian areas. Trees are cut off at ground level, leaving the roots and stump in place.

- Tree Removal—ROW Clearing (E10d): PG&E uses an integrated vegetation management program to manage incompatible vegetation (tall-growing plant communities) and maintain low-growing diverse plant communities that are compatible with transmission ROWs. Properly maintained ROWs are essential for ensuring the safety of the public and workers, minimizing vegetation-related outages, providing access for the inspection and maintenance of facilities, and ensuring the timely restoration of service during emergency conditions. PG&E vegetation management staff prioritizes lines and line sections to be worked in the current budget year. Prioritization is based on a NERC-regulated line, line criticality, level of risk of an outage, vegetation density, and property ownership. Goals of transmission ROW vegetation management also include protecting the transmission system in the event of a fire, as well as preventing vegetation-caused fires.

  NERC requires transmission owners to have a documented Transmission Vegetation Management Plan (TVMP). The TVMP needs to describe how owners conduct work on their applicable active transmission line ROWs to prevent sustained outages due to vegetation coming into contact with conductors and causing vegetation-related outages leading to blackouts or cascading outages (Standard FAC-003-2). Compliance with the standard is mandatory, and if a transmission owner allows vegetation to encroach into the Minimum Vegetation Clearance Distance ("imminent threat"), steep fines can be levied. PG&E's TVMP is associated with its critical transmission line ROWs, which operate at 200 kV or more, and some transmission line ROWs, which operate at less than 200 kV.

  The first step of the integrated vegetation management program is to clear the ROW of incompatible vegetation (e.g., any vegetation growing within the ROW that has

the potential, at maturity or at any other time in its lifecycle, to grow or fall into PG&E minimum clearance distances). Vegetation management typically is accomplished either mechanically or manually. However, because cutting or mowing can stimulate resprouting of incompatible vegetation, PG&E vegetation management staff monitors the ROW for resprouting and reinvasion by incompatible vegetation. When resprouting and reinvasion does occur, staff manages the ROW to achieve the desired outcome. A number of factors must be considered in selecting and implementing the appropriate management method or methods; management frequently includes the use of herbicide applications to selectively control the incompatible vegetation.

This Covered Activity is for those instances in which vegetation management is necessary as a distinct and separate action. The long-term goal of a vegetation management program in the transmission ROW is to convert tall-growing plant communities to low-growing communities. Low-growing shrubs, grasslands, or plants are preferred at the belly of the span, which is the middle 50 percent of the line between towers. Vegetation may be taller near towers. Management toward low-growing communities can be accomplished over a period of many years by selectively controlling incompatible plants while preserving low-growing shrubs, grasses, and plants. With proper management, the low-growing vegetation eventually can dominate the ROW and suppress the growth of the tall-growing vegetation, thereby reducing the need for future treatments.

ROW management is based on the concept of creating wire zones and border zones. The wire zone, which comprises the ROW area beneath the transmission wire plus 10 feet on either side, is managed for low-growing shrub-forb-grass plant communities (early successional). The border zone, which extends from the wire zone to the edge of the ROW, is managed for taller shrubs and brush communities (transition zone).

At approximately 10 locations per year, PG&E removes 1 mile of vegetation in a 25-foot-wide area under the belly of the span and prunes the remaining vegetation in a 75-foot-wide area along the 252 miles of 130 kV and 500 kV transmission lines. This estimated area is based on an assumption that PG&E removes most trees from under the belly of the span, and, depending on clearance requirements, leaves the trees near towers. In riparian areas, vegetation management is anticipated to be more targeted. Riparian vegetation clearing is not expected to extend beyond 1,000 feet in one continuous area, and even 1,000 feet of clearing is anticipated only once every 3 to 5 years. Low growing trees that stay below the clearance distance height are compatible and are retained. If the trees are incompatible than they will be removed, however the compatible understory vegetation will be retained.

- Tower Cage Clearing (E10e): PG&E performs vegetation management around poles and towers on its overhead transmission facilities to maintain the visibility necessary to inspect the footings for structural integrity as required by the CAISO Transmission Maintenance Agreement. Managing vegetation around poles and towers also keeps the interior of the tower clear of woody vegetation. Vegetation management includes patrol of poles and towers and removal of all trees, tree seedlings, and any material that obstructs the ability to visually inspect the tower and

pole footings. The work is scheduled throughout the year and the work type depends on the plant material to be removed. Vegetation management involves cutting vegetation with string trimmers or chainsaws, and treatment with herbicides to prevent regrowth, where appropriate.

PG&E performs this activity approximately 80 times a year. Approximately 10 percent of the time (eight times annually), vegetation is pruned or removed within a 1,600-square-foot area.

- Fee Strip Maintenance (E10f): To comply with city and county ordinances for fuels reduction and beautification, PG&E performs weed abatement work on PG&E-owned land under electric transmission facilities approximately once a year along a 1-mile ROW corridor. Work type and timing varies depending on requirements defined in each local ordinance. Ongoing vegetation management includes removing material by chemical, mechanical, or physical methods, depending on the site conditions, environmental considerations, types of vegetation, and size of the area. Methods may include mowing, discing, the use of string trimmers, and treatment with herbicides.

11. E11. Wood Pole Test and Treat

    - Inspection and Maintenance (E11a): PG&E identifies the line segments for inspection and testing based on age and condition. Staff evaluates all transmission and distribution wood poles that are at least 10 years old to determine whether they are suitable candidates for replacement, trussing, stubbing, or fiber-wrapping. Within a 3-foot radius around the pole, construction crews excavate 20 inches of soil and bore a minimum of three 9/16-inch holes at 45 degree angles to the axis of the pole. Each successive boring is 120 degree to the right and 12 inches above the previous bore. The shell thickness and circumference of the pole are used to determine whether the pole is a candidate for replacement or reinforcement. Inspection and maintenance occurs frequently, roughly 60,000 times per year. Approximately 10 percent (6,000) of these poles are in non-urban areas. The excavation of soil within the 3-foot radius of the existing pole results in disturbance.

    - Reinforcement (E11b): Approximately 180 poles (or 3 percent of the 6,000 wood poles in non-urban areas) that PG&E inspects will need reinforcement. Staff determines the type of reinforcement method—stubbing or trussing—after reviewing the testing results of an inspected line segment. Stubbing and trussing entail driving or setting a short steel truss or wood pole into the ground and attaching it to the existing pole to provide the support originally afforded by the pole butt. Fiber-wrapping is performed on poles that are not candidates for trussing or replacement. This entails fiber-wrapping the pole at or below ground level with a material that has been impregnated with preservatives to retard external deterioration of the pole. Excavation of soil within the 6-foot radius of the existing pole results in disturbance.

12. E12. New Distribution and Transmission Line Construction or Relocation: To provide additional service to customers or replace facilities, 2-mile extensions of distribution and transmission lines on new wood poles or light-duty steel poles are installed approximately

twice a year. Each line extension requires the following: (1) approximately 15 wood or direct-embedded light-duty steel or self-supporting steel poles per mile. Each work site is approximately 10 feet by 10 feet; (2) a pull site of approximately 50 by 50 feet, or similar to the site necessary for electric line reconductoring; and (3) a staging area of approximately 75 feet by 75 feet.

Access to the new or replacement transmission or distribution section may require construction of a new 10-foot by 1,000-foot unsurfaced access road. Similarly, degraded or eroding access roads may need to be repaired or replaced.

Once construction crews survey and stake the centerline for the new line, pole sites, pull sites, access roads, and laydown areas are cleared, if necessary. PG&E uses a machine auger to excavate the site of the new pole and any necessary anchor holes. The width and depth of the setting hole depend on the size of the pole, soil type, span, and wind loading. Typically, minimum pole-setting depths range from 4 to 14 feet.

Poles are framed (cross arms, pins, insulators, grounds, bonding, markers), and any equipment is installed. Any anchors and guys are installed before the pole is set. After the pole is set, conductors are strung (see *E8a. Pole and Equipment Repair and Replacement*, and *E8b. Utility/Wood Pole Replacement*).

13. E13. Tower Line Construction::To provide additional service to customers or to replace or upgrade facilities, approximately twice a year during the permit term PG&E may construct up to 2 miles of new transmission lines as an extension from existing transmission lines. These extensions may be constructed in natural vegetation and on agricultural lands that contain suitable habitat for Covered Species. These new lines would be supported by steel-lattice towers, light-duty steel poles, or tubular steel poles with concrete foundations. Each line requires the following: (1) a new ROW (maximum of 200 feet wide) no longer than 2 miles; (2) approximately 10 tower lines, each requiring an approximately 25-foot by 100-foot work site; (3) three pull sites with an average size of 50 feet by 150 feet; and (4) a laydown area of approximately 100 feet by 100 feet.

    Once construction crews survey and stake the centerline for the new line, tower sites, pull sites, access roads, and laydown areas are cleared, if necessary. Crews excavate an area of 25 by 100 feet for the foundation and concrete footings are poured. A crane or helicopter is used to erect the tower, depending on the tower type. After the tower is erected, conductors are strung (see *E9. Electric Line Reconductoring*).

14. E14. Minor Substation Expansion: Substations typically are constructed close to residential, commercial, or industrial development but may be located in natural vegetation. PG&E will limit minor substation expansions under the Bay Area O&M HCP to 10 acres of permanent vegetation loss per substation attributable to the substation footprint. This construction footprint may be required for additional transformers, fencing, and new distribution line outlets. The expansion area also may be used for setbacks, landscaping, and access. PG&E grades, paves, or surfaces the substation sites and fence the area for safety and security reasons.

    The Bay Area O&M HCP assumes five electric substation expansions over the permit term in undisturbed areas.

15. E15. Underground Line Construction: Underground line construction is conducted almost exclusively in urban settings. For both transmission and distribution lines, underground cable installation is accomplished using a cut-and-cover construction method (open trenching) for the underground power line, duct banks, and splice vaults. For this activity, the construction specifications for a 115 kV transmission line were considered as the average size; however, construction area dimensions vary with the voltage capacity of the line and are frequently smaller than those necessary for constructing a 115 kV line. Although this width varies, typically, a minimum access width of 65 feet is required to allow for the trench excavation and construction of the duct bank. The Covered Activity construction area length varies based on the length of the line. During construction, trench excavation spoil is removed and stored. If hazardous material is present, construction crews haul the material offsite and dispose of it appropriately. Underground line construction occurs about once every 10 years.

    - Duct Bank Installation: As the trench for the underground cable is completed, crew installs the cable conduit, reinforcement bar, ground wire, and concrete conduit encasement duct bank. The duct bank typically consists of polyvinyl chloride (PVC) conduits that contain the underground cables.

      The typical trench dimensions for installation of a single circuit are approximately 3 feet wide by 5 feet deep; however, trench depths vary, depending on soil stability and the presence of existing substructures. Dewatering, if necessary because of a high groundwater table, is conducted using a pump or well-pointing to remove water from the trench. Construction crews then pump the water into baker tanks and haul it away for proper disposal.

      Once the PVC conduits are installed, thermal-select or controlled backfill is imported, placed, and compacted. A road base backfill or slurry concrete cap then is installed.

    - Vault Installation: Vaults are installed at intervals that vary with the voltage capacity of the conductor. The vaults are used initially to pull the cables through the conduits and splice cables together. During operation, vaults provide access to the underground cables for maintenance inspections and repairs. Vaults are constructed of prefabricated steel-reinforced concrete and are typically about 20 feet long, 10 feet wide, and 8 feet deep. The total excavation footprint for a vault is typically about 22 feet long, 12 feet wide, and 10 feet deep.

    - Cable Pulling, Splicing, and Termination: After installation of the conduit, cables are installed in the duct banks. Each cable segment is pulled into the duct bank, spliced at each of the vaults along the route, and terminated at the bus structures (switchboard) inside the switchyards. To pull the cable through the duct bank, a cable reel is placed at one end and a pulling rig is placed at the other. With a fish line, a larger wire rope is pulled into the duct. The wire rope is attached to cable-pulling eyes for pulling. To ease pulling tensions, a lubricant is applied to the cable as it enters the duct. Cables are spliced at vaults after they are completely pulled through the ducts. A splice trailer is positioned directly above the vault manhole openings for each access. At each end, cables will rise out of the ground on a transition pole and terminate at a bus structure in the switchyards.

- Special Construction Methods: To minimize surface disturbance, horizontal directional drilling is the preferred method for conduit installation (see *Crossings*, above).

E. Other Covered Activities

1. Habitat Conservation Plan Biological Surveys: PG&E's personnel or its contractors would perform biological surveys for Covered Species in hot zones or for large activities. The individuals conducting the surveys would have the qualifications specified in the Service's survey guidelines or as otherwise approved by the Service. If surveys require physical capture and immediate release of Covered Species, such as California tiger salamander, California red-legged frog and Alameda whipsnake, for projects involving Covered Activities a biologist will be used. Biologists will also conduct surveys for Covered Species on private land within the study area being considered for purchase to provide mitigation of impacts on Covered Species. Although mitigation surveys are not expected to require handling of individuals, incidental take of Covered Species may result from vehicle movement. Such surveys, consistent with the Bay Area O&M HCP, would be covered by the Section 10(a)(1)(B) permit.

2. Management of Lands Purchased or Conserved for Mitigation: PG&E may have an ongoing obligation to manage mitigation lands where it holds title in fee. In the course of conducting standard maintenance and monitoring under a Service-approved management plan, take could occur. The Bay Area O&M HCP would cover management activities (e.g., fencing, surveying, conducting pre-activity biological surveys, conducting habitat enhancements, driving on these lands) and the potential for take, including management activities carried out by any independent land manager with whom PG&E has contracted to perform such activities on PG&E's behalf.

3. Management Actions to Support Enhancement of Other Conservation Lands: PG&E facilities cross multiple conservation lands throughout the Plan Area. There may be instances where PG&E is asked conduct beneficial management actions on others' conservation lands (e.g., excavate a stock pond or remove invasive weeds). These activities are also covered, though PG&E will seek USFWS approval prior to implementing these actions.

Calculating Covered Species Effects

A. Overview and Habitat Modeling

The process of estimating impacts on Covered Species was a two-step process that was both quantitative and qualitative. It is understood that Covered Activities have varying levels of impacts on Covered Species because of species distribution and life history. Some species are more susceptible to impacts from Covered Activities, while others are typically less affected. In order to accommodate these variations and better determine how each species might be affected, it was necessary to determine where Covered Species have the potential to occur within PG&E's Plan Area. First, PG&E incorporated modeled habitat data from the following conservation planning efforts: East Contra Costa HCP/Natural Community Conservation Plan (NCCP), Santa Clara County HCP/NCCP, Solano County draft HCP, Eastern Alameda County Conservation Strategy, and Santa Rosa Plain Conservation Strategy.

Where gaps existed, PG&E created habitat models in conjunction with the Service and CDFW, using an approach and analysis similar to the one used in the regional conservation planning efforts mentioned above. Species occurrence (i.e., occupancy) was extrapolated using a combination of the California Department of Fish and Wildlife's California Wildlife Habitats Relationship (CWHR) system and/or California Natural Diversity Database (CNDDB) (see Table 2-3 in the HCP for the source of each species' range. The habitat models include the land cover types that typically support the life-history needs of the species. The models tend to over-estimate habitat because they do not account for species density, barriers to movement, or microhabitat requirements. For example, portions of the habitat model for California red-legged frog includes dispersal habitat across agricultural lands; typically, this land cover is unsuitable, but during wet-weather events may be used for adult frog migration. Similarly, for California tiger salamander, the models include grasslands as suitable dispersal and upland habitat, irrespective of site-specific burrow densities, past ground disturbance, or distance from stock ponds or vernal pools.

Overlaying the modeled habitat of a Covered Species with the facility corridor (Plan Area) defines the area within which Covered Activities could affect that species. This approach provides a quantitative assessment of where Covered Activities could result in impacts on Covered Species.

B. Data Sources

A land-cover map was used to present the best available data appropriate for a regional assessment of the Bay Area. The data used to generate the land-cover map came from: the USDA Forest Service 2000 and 2007 Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) geodatabase (USDA Forest Service 2000 and 2007); the California Department of Forestry and Fire Protection 2002 Multi-Source Land-Cover Data, (v02_2); and the San Francisco Estuary Institute 1996 Modern Baylands EcoAtlas data.

Full descriptions of these data sources are described in the HCP in Section 2.2.5.1. For a description of the mapping procedures, see HCP Section 2.2.5.2.

C. Covered Species Habitat Models

PG&E, with input from the Service and CDFW, developed species-specific habitat models for most Covered Species. Models were generally developed to align with other Service approved regional conservation plans and strategies within the Bay Area to estimate the amount of habitat within the Plan Area and the potential impacts on Covered Species. The data sources, procedures, habitat classifications, and updates used for the models are described in HCP Section 2.3.4.

D. Covered Plant Habitats

PG&E explored multiple methods of estimating covered plant habitat in the course of developing the Bay Area O&M HCP. Such methods included evaluating corridors that extended beyond the ROW, creating habitat models (similar to the approach used for wildlife species), and evaluating the frequency and rate of discovery of new locations to create a predictive model of future distribution. However, the techniques tended to overestimate habitat because they included areas that did not have records of species, predicted habitat in areas that do not contain records of species, or resulted in population estimates that overstated actual observed populations. Therefore, PG&E predicted that use of the methods described above would result in expensive and ineffective survey requirements, without significant benefit to the Covered Species. PG&E, CDFW, and the Service

worked together to develop a straightforward approach to habitat estimation based on known populations. This approach uses CNDDB records. CNDDB includes 10 accuracy classes, the first two are specific occurrences (a specific point and a specific polygon[s]), the third is non-specific but bounded, and the fourth is a non-specific circular feature with a $1/10^{th}$ mile radius. Accuracy classes 5–10 are non-specific circular features with broader radii ranging from ($1/5^{th}$ mile to 5 miles); the larger the circle the more vague the location.

PG&E queried CNDDB records in the Plan Area to estimate the land area of habitat for each covered plant occurrence in the database with an accuracy class of 1 or 2. These accuracy classes were selected because they represent precise data that are accurately mapped. For covered plant occurrences with an accuracy class of 1, the occurrence was assumed to occupy a maximum of five acres of habitat, although in many cases this is likely to be an overestimate as the occurrences tend to be clusters of plants. For covered plant occurrences with an accuracy class of 2, the actual land area reported for the occurrence was used. Non-specific occurrences consisting of bounded areas or points with accuracy class rankings of 3 through 10 (least accurate) were not included in the determination of estimated habitat because of the lack of specificity for these locations; many of the non-specific occurrences are historic, and the location and current status of these populations has not been recently verified. Table 2-6 in the HCP identifies the extent of known and estimated habitat present for each covered plant species in the Plan Area and within the maximum corridor width (200 feet) of PG&E facilities.

PG&E and the Service may periodically update the modeled habitat for wildlife species in the HCP to ensure it accurately represents the habitat available for the Covered Species. For example, if FRAP is updated, PG&E may update its habitat models based on a more current land-cover data set. Similarly, if PG&E receives better wetland data for Santa Rosa Plain or Solano County, this data could be integrated to better assist PG&E in avoiding wetland habitats. Further, if it becomes apparent that certain areas of the modeled habitat are inaccurate (e.g., urban areas with no natural vegetation), then PG&E may revise the model in that specific area. PG&E will also continue to integrate CNDDB updates into its MapGuide system on a semi-annual basis to augment the modeled habitat and assist its planners and biologists in understanding where species have been detected.

E. Critical Habitat

Critical habitat has been designated for 13 Covered Species, all of which have designated critical habitat in the Plan Area. HCP Table 2-7, included for reference below, presents the extent of critical habitat in both the study area and the Plan Area.

HCP Table 2-7. Designated Critical Habitat

Covered Species	Designation List Date	Total Critical Habitat in California (acres)	Extent in Study Area (acres)	Extent in Plan Area (acres)
Invertebrates				
Conservancy fairy shrimp	February 10, 2006	161,787	4,414	324
Longhorn fairy shrimp	February 10, 2006	13,557	791	12
Vernal pool fairy shrimp	February 10, 2006	590,247	21,124	1,133
Vernal pool tadpole shrimp	February 10, 2006	228,784	12,663	607
Delta green ground beetle	August 8, 1980	969	969	32
Bay checkerspot butterfly	August 26, 2008	18,292	18,292	1,731
Amphibians				
California tiger salamander (Central California DPS)	August 10, 2004	199,107	46,326	869
California tiger salamander (Sonoma County DPS)	September 30, 2011	47,381	47,381	5,440
California red-legged frog	March 17, 2010	1,640,649	640,097	10,348
Reptiles				
Alameda whipsnake	October 2, 2006	154,835	152,809	4,240
Plants				
Contra Costa wallflower	April 26, 1978	305	281	41
Contra Costa goldfields	June 18, 1997	14,730	12,093	1,136
Antioch Dunes evening primrose	April 26, 1978	305	281	41

Conservation Measures

1. Purpose and Application of Habitat Models: For the numerous and small Covered Activities affecting less than 0.10 acre, a modeled habitat approach provides an alternative to on-the-ground biological surveys for species occurrence and habitat suitability. Habitat models utilize existing commercial data and biological information to assess the likelihood that a Covered Species or its habitat is present at a particular location. PG&E biologists and land planners will review the modeled habitat information in the company's GIS system to assess whether a Covered Activity falls within or close to modeled habitat, identify the modeled habitat that will be affected, and identify the location of Map Book zones and hot zones (explained in Sections 5.4.2 and 5.4.3). The type of modeled habitat that will be affected and the potential impacts on Map Book zones or hot zones inform the land planner or biologist on how to prescribe the appropriate AMMs or BMPs. Chapter 6, Plan Implementation and Funding, describes how the HCP administrator will work with land planners and biologists to retrieve information on Covered Activity impacts to calculate mitigation and prepare annual reports.

   The estimates of impacts on modeled habitat will be used to derive mitigation for impacts resulting from small activities. PG&E used impact estimates from HCP Table 4-1 (included on page 74 of this opinion) to develop its conservation strategy for activities generally considered "small" (affecting less than 0.1 acre) and those considered medium or large (affecting more than 0.1 acre). Small activities for which PG&E will use estimated impacts are G3a (fencing), G3b, G5, G6, G7, G8, and E5, E6a, E6b, E7, E8b, E9b, E10b, E10c, E11a, E11b, E15. The

temporary or permanent impacts from these small activities will not be restored in the field because the impacts will be extremely small and compensatory mitigation will be provided for most of these activities. Additionally, PG&E will periodically validate the restoration progress from a subset of these small activities, as described in Chapter 6, Plan Implementation and Funding, to ensure that average on-the-ground impacts occur as estimated and that habitat impacts do not exceed estimates (e.g., temporary impacts do not become permanent impacts).

For those Covered Activities affecting more than 0.1 acre, PG&E land planners and biologists will review and utilize the modeled habitat information to plan and prepare projects that require longer lead times, planning, and coordination. For these activities, PG&E will use actual, on-the-ground impacts as measured in the field by biologists and land planners to determine the extent of permanent or temporary impacts on habitat. Activities where actual impacts will be confirmed are G3a (Ergon mats), G9, G10, G11, G12, G13a, G14, G15, G16, G17, G18 and E9a, E10d, E12, E13, E14. Impacts from these activities will then be used to calculate required mitigation. Activities G1, G2, G4, G13b, and E1, E2, E3, E4, E8a, E10a, E10e, E10f are not expected to result in ground disturbance and, therefore, are unlikely to cause loss of Covered Species habitat.

Exceptions to the Use of the Models

PG&E's environmental review, planning, and screening processes will evaluate potential habitat impacts based on the species' modeled habitat and the site specific location of the Covered Activity. In the following three cases PG&E and the Service may determine that the habitat models are inaccurate at a fine scale: (1) the area is not habitat (e.g., the area contains urban lands, including landscaped areas that would not be considered habitat);(2) the area is no longer habitat (e.g., completed development projects have removed natural vegetation from a site) as demonstrated through aerial photographs or a site visit (e.g., contains areas adjacent to roads or urban land-cover without burrows, or certain agricultural crops that are removed from adjacent habitat); and (3). the area has other site-specific land use changes that make it unsuitable as demonstrated through reports, survey data, or other site-specific information (e.g., the area has been graded or otherwise substantially altered).

In these instances, PG&E will not implement AMMs, BMPs, or provide mitigation. Conversely, PG&E's land planners and biologists may detect suitable habitat where the habitat models indicate lack of habitat at a fine scale.

Updates to the Habitat Models

To ensure accurate representation of habitat available for the Covered Species, PG&E will review the habitat models for wildlife species once every 10 years, or more frequently as habitat model data becomes available. For example, if the current land cover (modeled habitat) datasets are updated, PG&E, with concurrence of the Service, will update the modeled habitat data layers and provide the data layers to the Service. When PG&E receives better wetland data for Santa Rosa Plain and Solano County, PG&E will integrate this dataset into the models to assist PG&E in avoiding wetland habitats. Similarly, the Service may recommend integration of additional information into the habitat models and PG&E will incorporate this imformation. PG&E will continue to subscribe to Rarefind/CNDDB and integrate CNDDB updates into its MapGuide GIS system twice a year to augment the habitat models. If a species range begins to expand as noted in CNDDB, the model for that species will be updated.

2. Hot Zones: To refine the model-based approach, PG&E developed "hot zones" for select covered wildlife species that only occur within specific and localized habitat types. A hot zone is a defined area containing an extant population of covered wildlife species with a small and well-defined range where the species would occur and may be affected by Covered Activities. PG&E created hot zones for the following habitat and species. Work in these areas requires implementation of hot zone AMMs.

    - Riparian hot zone: California freshwater shrimp (occupied streams identified in the Service recovery plan and based on discussions with CDFW).

    - Vernal pool hot zone: Longhorn fairy shrimp (critical habitat), Conservancy fairy shrimp (critical habitat).

    - Butterfly hot zone: Mission blue butterfly and Lange's metalmark butterfly (Antioch Dunes), and Bay checkerspot butterfly and San Bruno elfin butterfly (Coyote Ridge, Tulare Hill, and San Bruno Mountain).

    - Amphibian hot zone: California tiger salamander (in the Santa Rosa Plain, several key areas in Solano County, and in the vicinity of Stanford University).

    - Reptile hot zone: San Francisco garter snake (near San Francisco International Airport and Crystal Springs Reservoir, and several other locations on the Peninsula).

    - Marsh hot zone: California Ridgway's rail and salt marsh harvest mouse (bay fringe marsh habitats and salt ponds).

3. Map Book Zones: PG&E developed "Map Book zones" for covered plant species. These Map Book zones are areas with extant, known, or recently confirmed plant occurrences, as determined by a series of one-time botanical surveys, that warrants implementation of unique AMMs. PG&E began conducting these botanical surveys of occupied and potentially occupied areas using CNDDB records of covered plant species with accuracy classes 1 through 4 and review of aerial photos as a guide to create the onetime survey of Map Book zones. CNDDB defines accuracy class 1 as a specific bounded occurrence with a 262-foot radius; accuracy class 2 as a specific noncircular bounded area; accuracy class 3 as a nonspecific bounded area; and accuracy class 4 as a nonspecific circular feature with a 492-foot radius. During this initial series of surveys, biologists developed AMMs for each Map Book zone. The Map Book zone development process consisted of an aerial photo review of these locations to eliminate sites where the land use has changed, visiting reference sites, and conducting seasonally appropriate botanical surveys. In general, property owner access is required to complete these surveys. Surveys include suitable habitat within 300 feet of CNDDB occurrences with an accuracy class of 1, 2, or 3, and suitable habitat within 1 mile of CNDDB occurrences with an accuracy class of 4. These maps will help ensure that PG&E can avoid or minimize ground-disturbing impacts in habitat known to be occupied by covered plant species. When additional data are obtained in the future through surveys conducted for larger activities, such information will be incorporated into the Map Book zones.

4. Environmental Review, Planning, and Screening Processes by Line of Business: PG&E's environmental review, planning, and screening process varies by the specific line of business (LOB), with gas and electric distribution activities typically requiring less intensive review and planning than gas or electric transmission projects and activities. There are five work streams for reviewing and assessing environmental impacts from PG&E projects. Under the Bay Area O&M HCP, the respective environmental screening groups will be responsible for maintaining compliance with the HCP. In general, each of the environmental review groups will do the following for its respective LOB.

    - Screen covered and nonCovered Activities (i.e., planners and biologists review all types of projects, including new projects that are not covered under the HCP).
    - Apply AMMs, FPs, and other environmental protection measures (e.g., conditions from other state or federal permits).
    - Prepare a release to construction memorandum, which describes a quality assurance and environmental compliance process, to confirm that environmental screening is complete and all compliance requirements are documented for the work crews to follow.
    - Determine whether mitigation of impacts will be based on estimates or on results from an on-the-ground assessment of impacts.
    - Track temporary and permanent impacts as well as pertinent project information.
    - Report Covered Activity data to the HCP administrator for inclusion in the HCP annual report.

    For most, a team of land planners, biologists, cultural resource specialists, and environmental field specialists will first review, plan, and screen Covered Activities. After the completion of surveys, studies, and analyses, the appropriate natural resource protection measures (including AMMs) will be documented in a release-to-construction memorandum. PG&E will also use an automated environmental assessment [AEA] screening tool to screen many of the small electric (e.g., pole replacements) and small gas Covered Activities. Projects undergoing AEA will be automatically screened using a variety of data layers (e.g., waterways, CNDDB, serpentine soils, conservation easements, critical habitat, kit fox dens, levees, protected lands, anadromous fish streams, and vernal pools) and then released to construction if no data layers are flagged for manual review. If any AEA data layers are flagged for manual review, the activity will be evaluated further by a land planner or biologist before being released to construction. Modeled habitat, hot zones and Map Book zones will be integrated into the AEA screening process and will be flagged for review if a Covered Activity falls within any of these areas. A team of land planners, biologists, foresters, arborists, and tree inspectors will conduct environmental review of vegetation management Covered Activities before work in the field commences.

5. Environmental Review and Screening for Covered Plants: PG&E's approach to maintaining ESA compliance for listed plant species focuses on avoidance and minimization. PG&E strives to avoid the direct loss of individuals of covered plant species, but some loss will occur during O&M activities. The conservation strategy for covered plants is in line with PG&E's current practices for protecting listed plant species and implementing AMMs where practicable. Map

Book zones provide the foundation for the implementation of AMMs for plants. The specific process that will be followed is described as follows:

Small Activities within Map Book Zones

For small activities within a Map Book zone, PG&E will implement the AMMs. If the impact is minimized and not avoided, PG&E will assume the activity results in a permanent impact. Similarly, if it is not feasible to implement an AMM, PG&E will assume the activity results in a permanent impact. PG&E will mitigate these impacts based on the average area of disturbance for that type of small activity. PG&E is not proposing additional surveys or monitoring of these locations because the area will have already been surveyed during the correct seasonal window and the cost of additional surveys or monitoring typically exceeds the cost of providing mitigation. However, there may be instances where PG&E prepares surveys to determine if impacts are temporary or permanent. Monitoring would only occur for small activities if PG&E finds that these activities result in disturbances that are larger than calculated, or if surveys and monitoring are needed to protect the habitat of the species.

Large Activities within Map Book Zones

For large activities within Map Book zones, PG&E will use the Map Book zones data layers to assist in its overall environmental review and screening process. In some instances, additional site-specific review or surveys will be conducted to confirm the location of existing plant populations in relation to work areas. These reviews and surveys will help inform decisions regarding the presence or absence of habitat and if AMMs need to be assigned. Based on the Map Book zone and additional site evaluation, PG&E will implement the appropriate AMM. If the impact cannot be avoided, PG&E will prepare a restoration plan for the Service to review and approve. PG&E will adhere to the restoration plan and subsequent monitoring will reveal if the impact is permanent or temporary. PG&E will provide mitigation for large activities based on the number of plants affected or based on the amount of habitat affected. PG&E will monitor mitigation sites to determine the success of the restoration effort.

For some activities, such as emergency activities, work may occur in a Map Book zone without additional evaluation or AMMs. In these instances, PG&E will assume that impacts are permanent.

Large Activities outside Map Book Zones

For large activities outside of Map Book zones, PG&E will screen and evaluate areas outside of Map Book zone data layers and may discover additional CNDDB occurrences or suitable habitat. If a planner or biologist believes that the species might be present, they will conduct additional analyses and possibly prescribe a survey. If the site has suitable habitat and the survey cannot be conducted during the correct seasonal window, the work will be conducted consistent with the AMMs to minimize impacts; however, PG&E will assume the species is present and mitigate accordingly based on acreage of habitat disturbed. If the survey is conducted in the correct seasonal window, the survey will confirm either the presence or absence of the species. If the species is present, PG&E will select the appropriate AMM. If the impact cannot be avoided or if an annual plant species (for example) does not recover, PG&E will prepare a restoration plan for the Service to review and approve. PG&E will implement the restoration plan, and

subsequent monitoring will reveal if the restoration is successful and if the impact is permanent or temporary. Mitigation, if any, will be based on the results of the monitoring effort.

6. Biological Surveys and Monitoring: Biological surveys and monitoring will be limited for most, if not all, small Covered Activities because habitat models will drive the assessment of potential impacts and the required mitigation. However, for larger gas activities (G9, G10, G11, G12, G13a, G14, G15, G16, G17, and G18) and electric activities (E9a, E10d, E12, E13 and E14), PG&E will follow its existing work streams, in which a team of planners and biologists will conduct site assessments to position laydown areas, access routes, and exclusion zones. Also for these larger activities, PG&E will employ biologists to evaluate activities in hot zones and Map Book zones and determine the need for additional surveys or monitoring.

   Biological monitors may prescribe site-specific AMMs and will have the authority to stop work if a Covered Species is observed or if work is conducted in a way that may take a Covered Species. Biological monitors will assist with the identification and implementation of exclusion zones, work zones, and access routes. The biological monitor will ensure that all construction employees adhere to the species- and site-specific AMMs and BMPs.

   If the biologist or onsite biological monitor detect or observe any special-status species before, during, or after construction, he or she will follow the CNDDB Occurrence Submittal Policy and submit their observations to the CNDDB.

7. Avoidance and Minimization of Impacts: PG&E will avoid and minimize the impacts associated with Covered Activities through the use of field protocols and hot zone AMMs, species-specific AMMs, and covered plant AMMs, as well as vegetation management BMPs.

   - Field Protocols: Field protocols are PG&E's general measures designed to avoid or minimize potential impacts on biological resources and Covered Species. These measures provide clear and consistent guidance to address a broad range of issues including training, access, worksite management, erosion control, and natural resource protection (HCP Tables 5-1 and 5-2). PG&E trains crews and contractors on these measures and they are expected to implement the measures during their daily work.

   - Avoidance and Minimization Measures: PG&E will employ a suite of AMMs to avoid and minimize the impacts on Covered Species and habitat resulting from Covered Activities. These AMMs are specific to hot zones and covered wildlife and plant species (see HCP Table 5-1 on page 50 of this opinion). Hot zone AMMs ensure impacts on narrow endemic species are avoided or minimized; each measure focuses on a particular species or suite of species and will be applied when PG&E undertakes Covered Activities in a specific area.

HCP Table 5-1. Avoidance and Minimization Measures to Reduce Impacts on Covered Species

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Protocols			
Training			
HCP Team	FP-01	Hold annual training on habitat conservation plan requirements for employees and contractors performing Covered Activities in the Plan Area that are applicable to their job duties and work.	All Covered Species
Access and Worksite Management			
Field Crew	FP-02	Park vehicles and equipment on pavement, existing roads, or other disturbed or designated areas (barren, gravel, compacted dirt).	All Covered Species
Field Crew	FP-03	Use existing access and ROW roads. Minimize the development of new access and ROW roads, including clearing and blading for temporary vehicle access in areas of natural vegetation.	All Covered Species
Field Crew	FP-04	Locate off-road access routes and work sites to minimize impacts on plants, shrubs, and trees, small mammal burrows, and unique natural features (e.g., rock outcrops).	All Covered Species
HCP Team, Land Planners	FP-05	Notify conservation land owner at least 2 business days prior to conducting Covered Activities on protected lands (state and federally owned wildlife areas, ecological reserves, or conservation areas); more notice will be provided if possible or if required by other permits. If the work is an emergency, as defined in PG&E's Utility Procedure ENV-8003P-01 (see Appendix B), PG&E will notify the conservation land owner within 48 hours after initiating emergency work. While this notification is intended only to inform conservation land owner, PG&E will attempt to work with the conservation land owner to address landowner concerns.	All Covered Species
Field Crew	FP-06	Minimize potential for Covered Species to seek refuge or shelter in pipes and culverts. Inspect pipes and culverts, of diameter wide enough to be entered by a Covered Species that could inhabit the area where pipes are stored, for wildlife species prior to moving pipes and culverts. Immediately contact a biologist if a Covered Species is suspected or discovered.	All Covered Species
Field Crew	FP-07	Vehicle speeds on unpaved roads will not exceed 15 miles per hour.	All Covered Species
Field Crew	FP-08	Prohibit trash dumping, firearms, open fires (such as barbecues), hunting, and pets (except for safety in remote locations) at work sites.	All Covered Species
Field Crew	FP-09	During fire season in designated State Responsibility Areas, equip all motorized equipment with federally approved or state-approved spark arrestors. Use a backpack pump filled with water and a shovel and fire-resistant mats and/or windscreens when welding. During fire "red flag" conditions as determined by Cal Fire, curtail welding. Each fuel truck will carry a large fire extinguisher with a minimum rating of 40 B:C. Clear parking and storage areas of all flammable materials.	All Covered Species

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Crew	FP-10	Minimize the activity footprint and minimize the amount of time spent at a work location to reduce the potential for take of species.	All Covered Species

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Protocols			
Erosion Control			
Field Crew	FP-11	Utilize standard erosion and sediment control BMPs (pursuant to the most current version of PG&E's *Stormwater Field Manual for Construction Best Management Practices*) to prevent construction site runoff into waterways.	All covered aquatic species
Field Crew	FP-12	Stockpile soil within established work area boundaries and locate stockpiles so as not to enter water bodies, stormwater inlets, other standing bodies of water. Cover stockpiled soil prior to precipitation events.	All Covered Species
Natural Resource Protection			
Field Crew	FP-13	Fit open trenches or steep-walled holes with escape ramps of plywood boards or sloped earthen ramps at each end if left open overnight. Field crews will search open trenches or steep-walled holes the following morning prior to initiating daily activities to ensure wildlife are not trapped. If any wildlife are found, a biologist will be notified and will relocate the species to adjacent habitat or the species will be allowed to naturally disperse, as determined by a biologist.	Covered amphibians, reptiles, and mammals
Land Planner or Biologist, and Field Crew	FP-14	If the Covered Activity disturbs 0.1 acre or more of habitat for a Covered Species in grasslands, the field crew will revegetate the area with a commercial "weed free" seed mix.	All covered grassland species
Field Crew	FP-15	Prohibit vehicular and equipment refueling 250 feet from the edge of vernal pools, and 100 feet from the edge of other wetlands, streams, or waterways. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or biologist. Maintain spill prevention and cleanup equipment in refueling areas.	Vernal pool species, California freshwater shrimp, California red-legged frog, California tiger salamander (both Central California and Sonoma County DPSs), San Francisco garter snake
Land Planner or Biologist, and Field Crew	FP-16	Maintain a buffer of 250 feet from the edge of vernal pools and 50 feet from the edge of wetlands, ponds, or riparian areas. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the land planner, biologist, or HCP administrator to minimize impacts by flagging access, requiring foot access, restricting work until dry season, or requiring a biological monitor during the activity.	Vernal pool species, California freshwater shrimp, California red-legged frog, California tiger salamander (both Central California and Sonoma County DPSs), San Francisco garter snake

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Protocols			
Natural Resource Protection (continued)			
Field Crew	FP-17	Directionally fell trees away from an exclusion zone, if an exclusion zone has been defined. If this is not possible, remove the tree in sections. Avoid damage to adjacent trees to the extent possible. Avoid removal of snags and conifers with basal hollows, crown deformities, and/or limbs over 6 inches in diameter.	All Covered Species
Land Planner or Biologist, and Field Crew	FP-18	Nests with eggs and/or chicks will be avoided: contact a biologist, land planner or the Avian Protection Program manager for further guidance.	All nesting bird species
Hot Zone Avoidance and Minimization Measures			
Biologist/Field Crew	Hot Zone-1	Work will avoid pools and streams. Field crew will prevent any damage to the bank and streamside vegetation during placement or movement of materials on the stream banks. Streamside vegetation overhanging into pools or runs will, to the maximum extent practical, not be removed, trimmed, or otherwise modified.	California freshwater shrimp
Biologist/Field Crew	Hot Zone-2	Ground-disturbing activities will not occur from the first significant rain (1 inch) during the wet season, October 15–April 15, within 250 feet of the edge of vernal pools unless the field crews conduct the work from an established roadway. Access rock outcrops only on foot during all times of year. Ground-disturbing activities may occur during this period if a biologist implements measures to avoid the habitat and the impacts and mitigation are consistent with the HCP. Measures could include directing crews on access, use of erosion/sediment fencing, use of access mats, and other techniques to avoid direct or indirect effects. PG&E may seek guidance from the Service as to the suitability of additional measures to avoid or minimize take of this species.	Longhorn fairy shrimp
Biologist/Field Crew	Hot Zone-3	A biologist will survey for host and nectar plants (lupine, thistles, viola) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will only be allowed during flight period, May 15–July 31, to reduce the risk of butterfly mortality.	San Bruno elfin butterfly, Callippe silverspot butterfly, Mission blue butterfly (San Bruno Mountain)
Biologist/Field Crew	Hot Zone-4	A biologist will survey for host and nectar plants (lupine, thistles, viola) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will only be allowed during flight period, March 1 – July 15, to reduce the risk of butterfly mortality. PG&E will avoid and minimize the introduction or spread of noxious weeds from vehicular traffic through employee education, minimizing off-road travel, and inspecting vehicles to be sure they are not transporting observable noxious weeds.	Lange's metalmark butterfly (Antioch Dunes National Wildlife Refuge)

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Hot Zone Avoidance and Minimization Measures (continued)			
Biologist/Field Crew	Hot Zone-5	A biologist will survey for host and nectar plants (dwarf plantain, purple owl's clover, or paintbrush) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will be allowed during flight period, March 1–April 30. PG&E will avoid and minimize the introduction or spread of noxious weeds from vehicular traffic through employee education, minimizing off-road travel, and inspecting vehicles to be sure they are not transporting observable noxious weeds.	Bay checkerspot butterfly (Mapped serpentine grassland in Santa Clara County)
Biologist/Field Crew	Hot Zone-6	Limit activities to foot access only when working off of established roadways unless a biological monitor flags off-road access routes for equipment that minimize impacts on habitat and species. This includes the identification and avoidance of vernal pools and stock ponds. Covered Activities that cannot avoid vernal pool impacts will be completed when pools are clearly dry.	California tiger salamander (both Central California and Sonoma County DPSs)
Biologist/Field Crew	Hot Zone-7	Activities that result in ground disturbance will occur May 1–October 30 (active season). Vegetation will be cut using hand tools to 3 inches in height. Once the ground is visible, a visual survey for San Francisco garter snake will be conducted by the biologist prior to additional ground disturbance. Field crews will install solid exclusion fencing if the work is in areas of known species presence. If work needs to occur during the inactive period (November 1–April 30) and is located in an area of known occupancy, flag and avoid any burrows by at least 10 feet wherever possible. If any burrows cannot be avoided by this distance, a biologist will inspect following activities to determine whether or not the burrow has been collapsed. If a burrow is collapsed, the biologist shall make efforts to open the burrow.	San Francisco garter snake
Biologist and Field Crew	Hot Zone-8	For activities that will result in ground disturbance in tidal marsh or coastal wetland habitat, including the removal of marsh vegetation, a biologist will flag access routes for crews when working in pickleweed (Salicornia) or smooth cordgrass (Spartina alterniflora) dominated habitats in order to minimize impacts on these species. Crews will hand-carry equipment and use protection mats (landing pads, pallets) to minimize ground disturbance when working within pickleweed or smooth cordgrass. Small areas of healthy vegetation will be cleared by hand prior to placement of protective mats.	California Ridgway's rail, salt marsh harvest mouse (Marsh/Bay Fringe)

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Hot Zone Avoidance and Minimization Measures (continued)			
Biologist and Field Crew (continued)		To avoid take of salt marsh harvest mouse, the biologist will assess the site to determine if: vegetation protection mats are appropriate, use of helicopters is needed, vegetation removal by hand is needed, and an onsite biological monitor is needed. Prior to placement of mats or removal of vegetation, the vegetation will be disturbed (i.e., flushed) to force movement of salt marsh harvest mouse into adjacent tidal marsh areas. Immediately following flushing, the field crew will place a mat or manually remove vegetation with nonmotorized tools (e.g., hoe, rake, trowel, or shovel) to the bare ground. Conduct work within 700 feet of wetlands suitable for the California Ridgway's rail September 1–January 15.	
Species-Specific Avoidance and Minimization Measures for Activities E9 (reconductoring) , E12–E14 (pole and tower line construction and substation expansion), and G16–18 (pipeline safety enhancement projects)			
Biologist and Field Crew	SJKF-1	A biologist will inspect the work site no more than 30 days prior to construction to determine if potential San Joaquin kit fox dens are present. If potential dens are located within the proposed construction footprint and cannot be avoided during construction, a biologist will determine if the dens are occupied. All potential dens within the construction footprint will be dusted with appropriate tracking substrate or monitored with a motion-sensor camera for a minimum of 3 days to determine occupancy unless scat, discarded bones, and tracks are observed and then the den is presumed occupied. Exit ramps will also be installed in these areas at both ends of the excavated areas. If potential San Joaquin kit fox dens are present within the construction footprint or within 200 feet of the construction boundary, disturbance and destruction will be avoided where possible. If the potential dens are determined to be unoccupied and cannot be avoided, no further action is needed. If an occupied or natal/pupping den is discovered within the construction area or within 200 feet of the project boundary, the Service shall be immediately notified to discuss protective measures; if Service staff are unable to be reached, PG&E will set up exclusion zones, visual screens, and construction monitors to ensure direct mortality is avoided. Under no circumstances will the den be disturbed or destroyed.	San Joaquin kit fox (Grasslands in eastern Alameda, and southeastern Contra Costa Counties)

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Biologist/Field Crew	Wetland-1	Identify vernal pools and establish buffers. Maintain a buffer of 250 feet around vernal pools and vernal pool complexes. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the biologist or HCP administrator to minimize impacts. These measures include flagging access, requiring foot access, restricting work until the dry season, requiring a biological monitor during the activity, or excavating burrows in ROWs where trenching will occur. Activities must maintain the downstream hydrology to the vernal pool or complex. Additional minimization measures may be implemented with prior concurrence from the Service.	Vernal pool species, including California tiger salamander (both Central California and Sonoma County DPSs)

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Species-Specific Avoidance and Minimization Measures for Activities E9 (reconductoring), E12–E14 (pole and tower line construction and substation expansion), and G16–18 (pipeline safety enhancement projects) (continued)			
Biologist/Field Crew	Wetland-2	Identify wetlands, ponds, and riparian areas and establish buffers. Maintain a buffer of 50 feet around wetlands, ponds, and riparian areas. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the biologist or HCP administrator to minimize impacts. These measures include flagging access, requiring foot access, restricting work until the dry season, requiring a biological monitor during the activity, or excavating burrows in ROWs where trenching will occur. Activities must maintain the downstream hydrology to the wetland, pond, or riparian area. Additional minimization measures may be implemented with prior concurrence from the Service.	California freshwater shrimp, California tiger salamander (both Central California and Sonoma County DPSs), California red-legged frog, San Francisco garter snake
Other Regional Planning Measures			
HCP Administrator	Minor New-1	For minor new construction activities under 2 miles in length, excluding upgrades and replacements, (G15, E12, E13, and E15), PG&E will notify the USFWS of the anticipated project and provide a summary of the activity. The summary will include information on HCP measures to avoid, minimize and mitigate the effects of the project on covered species, confirm there is adequate take authorization remaining for the covered species, and confirm that activity does not have a reasonably certain likelihood of take of listed non-covered species. If the USFWS has concerns about the work they will notify PG&E within 5 business days and resolve the concerns within 10 days.	All covered species
HCP Administrator	Edgewood Park-1	When PG&E is planning a new gas pipeline extension or pipeline replacement project in Edgewood Park, PG&E will meet with the USFWS and affected stakeholders during the planning phase to provide an opportunity for input.	San Bruno elfin butterfly, Callippe silverspot butterfly, Mission blue butterfly and listed plants
Covered Plant Avoidance and Minimization Measures			
Field Crew	Plant-01	No herbicides will be used for vegetation management, pole clearing, or any other purpose within 100 feet of a Map Book zone (MBZ) (except vegetation management's direct application to cut stumps when greater than 25 feet from a MBZ and in conformance with applicable pesticide regulations).	All covered plants
Field Crew	Plant-02	Heavy equipment shall remain on access roads or other previously disturbed areas unless otherwise prescribed by a land planner, biologist, or HCP administrator.	All covered plants
Biologist/Field Crew	Plant-03	Stockpile separately the upper 4 inches of topsoil during excavations associated with Covered Activities. Stockpiled topsoil will be used to restore the disturbed ROW.	All covered annual plants[a]

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Biologist	Plant-04	When Covered Activities greater than 0.1 acre in size within a MBZ will have direct impacts on Covered Species, work with the crew to place flagging, fencing, or other physical exclusion barriers to minimize disturbances. If the work will directly impact covered plant species, implement Plant-05, -06, -07, and -08 AMMs.	All covered plants
Biologist	Plant-05	If a covered plant species is present and it cannot be avoided, PG&E will salvage plant material (i.e., seeds, cuttings, whole plants) and prepare a restoration plan that details the handling, storage, propagation, or reintroduction to suitable and appropriate habitat subject to the Service review and approval.	All covered plants
Biologist	Plant-06	If a covered annual plant species is present and it cannot be avoided, conduct Covered Activities after seeds have matured to the extent possible.	All covered annual plants[a]
Biologist	Plant-07	If a covered perennial plant species is present and it cannot be avoided, conduct Covered Activities after seeds have matured to the extent possible. Minimize disturbance to the below-ground portions of the plants (e.g., roots, bulbs, tubers) to the extent possible.	All covered perennial plants[b]
Biologist/field crew	Plant-08	PG&E will follow current best management practices to prevent the spread of Phytophthora when working on *gas transmission* facilities in the Map Book Zone for coyote ceanothus in Santa Clara County. PG&E will clean equipment (i.e., vehicles, equipment, tools, footwear and clothes) at designated cleaning stations before and after leaving these work locations. All PG&E staff and subcontractors working in these areas will be trained on the risks of spreading Phytophthora and will work to minimize the unnecessary movement of soil and plant materials when in this area. PG&E will also take care to prevent the spread or contamination during plantings or restoration activities. (See Phytophthoras in Native Habitats Working Group Recommendations, October 2016 for more information.)	Coyote ceanothus

HCP Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Species-Specific Avoidance and Minimization Measures for Activities E9 (reconductoring) , E12–E14 (pole and tower line construction and substation expansion), and G16–18 (pipeline safety enhancement projects) (continued)			
Biologist	Plant-08	PG&E will prune shrubs in a manner that promotes re-sprouting. If permanent impacts are unavoidable, establish new individuals by planting seedlings or from cuttings in adjacent suitable habitat. PG&E will implement best management practices including vehicle, equipment, and personnel hygiene protocols; procedures for conducting activities in infected areas; and timing restrictions that avoid working when soils are moist and the likelihood of spreading P. cinnamomi is greatest.	Pallid manzanita

Note: In some instances biologists with additional training or permits will be used when PG&E is surveying for the Covered Species, species require handling, or other instances when take is likely.

[a] Covered annual plant species are Sonoma sunshine, Marin dwarf-flax, Burke's goldfields, Contra Costa goldfields, Sebastopol meadowfoam, white-rayed pentachaeta, and Metcalf Canyon jewelflower.

[b] Covered perennial plant species are pallid manzanita, coyote ceanothus, fountain thistle, Santa Clara Valley dudleya, Contra Costa wallflower, and Antioch Dunes evening primrose.

HCP Table 5-2. Vegetation Management Best Management Practices to Reduce Environmental Impacts

BMP #[a]	Best Management Practice
BMP 1 (FP-01)	PG&E employees and vegetation management contractors performing Vegetation Management activities shall receive ongoing environmental orientation. Orientation shall include review of environmental laws and guidelines that must be followed by all PG&E employees and contract vegetation management personnel to reduce or avoid impacts on Covered Species during vegetation management activities.
BMP 2 (FP-05)	Notify federal and state land managers of pending work, and schedule annual meetings with these land managers, as requested. Notify local agency land managers of pending work as requested, or as sensitive issues arise.
BMP 3 (FP-09)	During fire season in designated State Responsibility Areas, motorized equipment shall have federally approved or state-approved spark arrestors; all vehicles shall be equipped with firefighting tools as appropriate and in accordance with all applicable laws, rules, regulations, orders, and ordinances.
BMP 4	Contractor shall be responsible for checking the daily Project Activity Level (a measure of fire weather conditions that, at certain levels, restricts activities otherwise permitted) during fire season when working on U.S. Forest Service (USFS) property.
BMP 5	Smoking shall not be permitted during fire season, except in a barren area or in an area cleared to mineral soil at least 3 feet in diameter. Under no circumstances shall smoking be permitted during fire season while employees are operating light or heavy equipment, or walking or working in grass and woodlands.
BMP 6 (FP-08)	Hunting, firearms, portable stoves, open fires (such as barbecues) not required for the vegetation management activity, and pets (except for safety in remote locations) shall be prohibited in vegetation management work activity sites. All trash, food items, and human-generated debris shall be properly contained and/or removed from the site.

BMP #[a]	Best Management Practice
BMP 7 (FP-07)	To avoid hitting or crushing wildlife in the roadway and to avoid generating dust, vehicles will not exceed a speed limit of 15 miles per hour on low-use unpaved roads such as agricultural field roads, transmission right-of-way roads, and non-system numbered USFS roads with locked gates. Travel on high-use unpaved roads such as USFS logging roads shall be as slow as local traffic conditions allow.
BMP 8	All roads, fences, and structures damaged as a result of vegetation management operations shall be repaired and reported to the work group supervisor and the PG&E vegetation management representative. All gates shall be left open if found open or locked if found locked.
BMP 9 (FP-02, FP-03)	Vehicles and equipment shall be parked on pavement, existing roads, and previously disturbed areas to the extent practicable. In environmentally sensitive areas, vehicle access to work sites shall be restricted to existing roadways.
BMP 10 (FP-15)	When practical, fuel vehicles and equipment offsite. If it is necessary to fuel onsite the following precautions shall be taken: No vehicles or equipment shall be refueled within 250 feet of vernal pools, and 100 feet of a watercourse, ditch, wetland, or a pond, unless a bermed and lined refueling area is constructed. The fueling operator must stay with the fueling operation at all times. Do not top off tanks. Spill containment and cleanup materials must be available. Spills must be immediately cleaned up and contaminated materials disposed of properly. Fueling trucks and operators must have all necessary permits, licenses and training. Any spills must be reported immediately to supervisor and PG&E vegetation management representative.
BMP 11	Debris that remains from lop and scatter operations shall be left at a height no greater than 18 inches.
BMP 12 (FP-11)	After vegetation management activities, if the amount of bare soil exposed in one location exceeds 0.1 acre, then erosion control measures shall be implemented. These measures may include straw mulching, seeding, and use of straw waddles. (No rice straw will be used around wetlands containing vernal pools.)
BMP 13 (FP-16, Wetland-1)	Avoid operating vehicles and equipment within 250 feet (or the maximum distance practicable) of the edge of a vernal pool and, to the extent practicable, avoid walking through a vernal pool.
BMP 14	When routine vegetation management activities are conducted in an area of potential valley elderberry longhorn beetle habitat, a qualified individual will survey for the presence of elderberry plants within a minimum of 20 feet from the work site within the utility easement, ROW, franchise, or license, and shall note in vegetation management work request documents to avoid or minimize potential impacts on elderberry plants. If elderberry plants have one or more stems 1 inch or more in diameter at ground level, additional measures identified in the *Valley Elderberry Longhorn Beetle Conservation Plan* shall be implemented. Otherwise, no additional minimization, avoidance, or protective measures are required.
BMP 15 (FP-18)	When vegetation management staff is aware of known active northern spotted owl nests through either the CNDDB viewer or property owner information, PG&E will implement the following. If the work is within 0.25 mile of a known active nest(s), the work will be performed either during a limited operating period of August 1 to January 31, or, if the work falls within the breeding period and is within 300 feet of the nest, the PG&E Avian Protection Program manager will be contacted for guidance and work will be performed as directed by the Avian Protection Program manager. If the work is scheduled during breeding season and if the work is 300 feet to 1/4-mile from the nest, work will be performed using hand tools (not chainsaws) or hydraulic pruners if the work is accessible from a regularly trafficked roadway. If the work cannot be performed with hand tools or hydraulic tools, then vegetation management staff will contact the Bird Program manager for guidance. In locations where known active nests occur, vegetation management staff will increase pruning distances from the conductors or pursue tree/brush removals in order to minimize the number of return visits to the area.

BMP #[a]	Best Management Practice
BMP 16	All PG&E employees and contractors shall follow the Vegetation Management Migratory Bird Process, when applicable to vegetation management activities, to comply with Migratory Bird Treaty Act.
BMP 17	When performing work in counties subject to the Sudden Oak Death quarantine, Vegetation Management Sudden Oak Death Protocols must be followed.
BMP 18	Vegetation management personnel shall verify that the environmental screening process was followed prior to conducting vegetation management activities associated with capital jobs and other non-vegetation management work. Vegetation management personnel shall follow any environmental protection measures identified for the job.
BMP 19	If cultural resources are found (e.g., old bottles, cans, buildings), they shall be left in place and undisturbed. If it is necessary to move or disturb them to complete the work, or if human remains are found, stop work and contact the PG&E vegetation management representative.
BMP 20	All equipment shall be permitted by the Air Resources Board as required, including portable equipment or new stationary equipment with internal combustion engines greater than 50 Brake HP, (e.g., tow-behind generators, chippers, and truck- or trailer-mounted air compressors and pumps).
BMP 21	When working within 50 feet of residences or government or commercial buildings, engine idling, noise, and odor should be minimized to the extent practicable. Also adhere to the restrictions noted in the Commercial Vehicle Idling Tailboard when working on school grounds or within 100 feet of a school (K–12 and below, including play areas and sports fields, and day care facilities).
BMP 22	Contractor shall have the ability to communicate quickly with their supervisor and/or PGE. This can be done by having a working cell phone or radio on the job site at all times or by identifying the closest area of cell phone reception or closest public telephone and familiarizing all employees with that location.
BMP 23	If an environmental protection incident occurs, such as accidental introduction of substances into waterways or wetlands, accidental taking of an endangered species, or hazardous material spills, etc., call your supervisor and the PG&E vegetation management representative immediately.
BMP 24	Vegetation removal shall be completed without the use of self-propelled mechanical equipment (e.g., Hydro-ax, Brontosaurus, Slashbuster).
BMP 25 (FP-10)	The disturbance or removal of vegetation within the work area shall not exceed the minimum necessary to complete operations, subject to other public and health and safety directives governing the safe operations and maintenance of electric and gas facilities. Precautions shall be taken to avoid damage to non-target vegetation.
BMP 26	Cleared or pruned vegetation, grass clippings and woody debris (including chips) shall be disposed of in a legal manner. All cleared vegetation and debris, grass clippings and woody debris (including chips) shall be removed from any wetland, ditch, pond, or stream and placed or secured where they cannot re-enter the watercourse.
BMP 27	Vegetation that at mature height does not pose a threat to the conductors shall not be removed, unless the removal is required to maintain compliance with California Public Resource Code Section 4292 (pole clearing).
BMP 28	Any vehicles driven and/or operated within or adjacent to streams shall be checked and maintained daily to prevent leaks of materials that, if introduced to the water, could be harmful to aquatic life.
BMP 29 (Plant-02)	Vehicle access to streams and wetlands shall be limited to existing roads and crossings.

BMP #[a]	Best Management Practice
BMP 30	When possible, activities near streams, wetlands, or on saturated soils shall be conducted during the dry season (generally May 15–October 15) or during periods of minimum flow. If it is not possible to perform the work in the dry season, perform rainy season work during dry spells between rain events.
BMP 31 (Plant-01)	All herbicide applications performed by vegetation management contractors shall be made in compliance with label requirements as well as all appropriate federal, state, and local laws, rules, and regulations. Note: Use of herbicides and pesticides is not Covered Activities under the HCP.
BMP 32	Only herbicides registered by the federal Environmental Protection Agency and California Environmental Protection Agency shall be applied.
BMP 33	During the performance of Vegetation Management ROW Enhancement Operations, operator ID numbers and Site ID numbers shall be obtained for each facility as required by the County Agricultural Commissioner.
BMP 34	Each application shall be covered by a written *Pest Control Recommendation.*
BMP 35	A Licensed Pest Control Advisor shall oversee all herbicide and tree growth regulator applications. A qualified applicator shall supervise contractors making herbicide and tree growth regulator applications for vegetation management.
BMP 36	County Agricultural Commissioners shall be invited to inspect the applicator and application operations when appropriate.
BMP 37	The Pest Control Business License holder (applicator) shall report herbicide use monthly to the County Agricultural Commissioner.
BMP 38	Contractor shall conduct annual worker safety training sessions for all contractor employees involved in the herbicide applications and manual/mechanical clearing. As requested, documentation of this training shall be on file with the PG&E representative who administers their contract.
BMP 39 (Plant-01)	Selective application techniques should be used for Vegetation Management ROW Enhancement Operations wherever practical so that desirable vegetation is not adversely affected.
BMP 40	Buffer widths shall apply pursuant to *Vegetation Management Herbicide Buffer Widths to Protect Non-Target Organisms* as identified on product packaging.
BMP 41	Mixing and loading of herbicides is prohibited in watercourse protection zones (see BMPs 60 and 61 for watercourse protection zones).
BMP 42	Applicator shall have a spill prevention and cleanup kit in their vehicle and at the job site.
BMP 43	Backpack equipment or light-capacity power equipment shall be used for all directed foliar applications.
BMP 44	Empty herbicide containers shall be taken offsite, triple rinsed, and disposed of in a proper manner.
BMP 45	Minimum operating pressures shall be used. Nozzle tips that produce a coarser droplet should be used to minimize drift.
BMP 46	Pesticides shall not be transported in the same compartment with persons, food, or feed. Pesticide containers shall be secured to the vehicle during transportation in a manner that shall prevent spillage into or off the vehicle.
BMP 47	The contractor shall have a written training program for employees who handle pesticides. The written program must describe the materials and the information that shall be provided and used to train the employees.
BMP 48	Training must be completed before an employee is allowed to handle any pesticide and continually updated to cover any new pesticides that shall be handled. Training must be repeated at least annually thereafter.

BMP #[a]	Best Management Practice
BMP 49	These special precautions shall be observed during periods of inclement weather: Applications shall not be made in, immediately prior to, or immediately following rain when runoff could be expected. Applications shall not be made when wind and/or fog conditions have the potential to cause drift. Basal bark applications shall not be made when stems are wet with rain, snow, or ice.
BMP 50	Prior to any ROW clearing project or any enhancement project, the CNDDB shall be checked for any records of threatened, endangered, or sensitive species.
BMP 51	Any locations identified through the CNDDB search shall be flagged and appropriate avoidance measures shall be put in place. Tailboards shall be held before work begins.
BMP 52 (Wetland-01, Wetland-02)	Sensitive habitats such as meadows, riparian areas, wetlands, vernal pools, and serpentine outcrops shall be flagged and appropriate avoidance measures shall be put in place. Tailboards shall be held before work begins.
BMP 53	All existing roads shall be kept open and erosion control measures re-installed after the project is completed or during inclement weather.
BMP 54	Contractor shall clear all vegetation 10 feet around and under all towers/poles and guy wires. Only manual clearing work can occur within the above-mentioned 10 feet. No mechanical equipment shall be used within 10 feet of the above-mentioned structures. All vegetation cut under and within 10 feet of the towers shall be removed from the area and mulched to a depth not greater than 18 inches.
BMP 55	All debris that remains from mowing operations shall be mulched to a depth not greater than 18 inches.
BMP 56	Trees greater than 12 inches in diameter at breast height shall be hand-felled and then the top and limbs removed and the bole decked on the side of the ROW.
BMP 57	Contractor shall flag all guy wires 200 feet in advance of working an area, using bright colored flagging (a minimum of three flags per wire).
BMP 58	Contractor shall have a water source containing a minimum of 300 gallons of water and 250 feet of 1-inch hose onsite at all times during operation. The water source must either be self-propelled or always attached to a vehicle capable of moving it to where it is needed. Where access/terrain allows, contractor's water source must always be within 500 feet of the mowing/cutting operation. Excess water shall be disposed of in accordance with all laws and regulations.
BMP 59	Each mower shall have a minimum of a 10-pound, Class A, B, C fire extinguisher mounted in the cab.

HCP Table 5-2. Continued

BMP #[a]	Best Management Practice
BMP 60	Contractor must stay onsite for one-half hour after mowing operations end for the day to ensure fire safety. When extreme fire levels are reached, the following extra precautions must be implemented immediately. • An additional support person shall be dedicated to follow the mower with an Indian Back Pump and McLeod. • Mowing hours will be reduced to the hours of 5:00 a.m. through 12:30 p.m. • The use of a humidity meter shall occur. A reading of less than (<) 20 percent humidity shall stop the mowing operation for the day. Readings shall be taken every 3 hours during operation.
BMP 61	Watercourse protection zones shall be marked by the PG&E representative in charge with brightly colored flagging prior to the start of any mowing/timber operation. Water classes are defined by the California Forest Practice Rules (14 California Code of Regulations Section 916.5). The following watercourse protection zone clearances must be maintained at all times. • Class 1 and 2 watercourses with a slope < 30 percent: No heavy equipment within 50 feet. • Class 1 and 2 watercourses with a slope > 30 percent: No heavy equipment within 75 feet. • Class 3 watercourse: No heavy equipment within 25 feet. • Unclassified watercourses with a defined channel: No heavy equipment within 25 feet. No mowing shall be allowed within the above distances. Trees within the above distances shall be removed manually. Brush and other small vegetation shall be left for a shade canopy on the watercourse. The actual width of the watercourse protection zone may vary based on a PG&E representative's judgment in the field. All impaired watercourses and their protection zone clearances shall be identified before the project begins.
BMP 62	The following protection measures are designed to prevent adverse impacts on water quality, help protect soil resources, and minimize the loss of riparian vegetation. 1. Plants in watercourse protection zones that do not pose an imminent or clearly foreseeable future threat to conductors shall not be removed. 2. To help prevent erosion and soil displacement, exclusion zones may be increased in areas with steep slopes or highly erodible soils. 3. Leave at least 50 percent soil cover (i.e., mulch or vegetative ground cover) for erosion control in watercourse protection zones.

[a] Where PG&E field protocols or AMMs are similar or overlap, they are referenced in parenthesis under the BMP number.

HCP Table 5-3. Conservation Strategy Summary for Covered Activities

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact)														
Gas														
G1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
G2. Inspections	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
G3a. Pipeline Remedial Maintenance (Fencing)	0.06	1.15	10	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Estimate	Some ability to make minor adjustments to work areas.
G3b. Internal Pipeline Inspection	0.06	2.98	50	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G4. Compressor Station Upgrades and Maintenance (Mowing)	0.28	0.28	1	Yes	No	No	No	Yes	No	No	No	No	NA	Mowing around facility.
G5. Pipeline Electric Test System Installation	0.06	0.40	7	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Limited ground disturbance, very small footprint.
G6. Pipeline Valve Maintenance – Recoating	0	0.00	5	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G7. Pipeline Valve Maintenance – Replacement or Automation	0	0.00	0	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G8. Pipeline Cathodic Protection	0.02	0.11	5	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Limited ground disturbance, very small footprint with deep well anodes.

HCP Table 5-3. Continued

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Gas(continued)														
G12. Pipeline Telecommunication Site Maintenance (Staging Area)	0.01	0.34	1	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Estimate	Limited ground disturbance.
G13b. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	0.01	0.05	5	Yes	Yes	No	No	No	No	No	No	No	NA	Limited ground disturbance.
Electric														
E1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
E2. Inspections	0	0.00	1	Yes	Yes	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
E3. Insulator Washing or Replacement	0	0.00	2	Yes	Yes	Yes	Yes	No	No	No	No	No	NA	No ground disturbance.
E5. System Outage Repair	0.01	5.56	500	No	No	No	No	No	No	No	Yes	Yes	Estimate	Emergency work.
E6a. Tower Replacement or Repair	0.02	8.68	360	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Estimate	Limited ground disturbance; mostly from foundations of footings.
E6b. Access Boardwalk Replacement or Repair	0.00	0.03	15	Yes	Yes	No	NA	Yes	No	No	Yes	Yes	Estimate	Several square feet of ground disturbance.
E7. Facility Installations (Shoo-Flies)	0.06	5.74	100	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Estimate	Limited ground disturbance. These are temporary structures to keep electricity flowing.

HCP Table 5-3. Continued

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E8a. Pole Equipment Repair and Replacement	0	0.00	500	Yes	Yes	Yes	Yes	No	No	No	No	No	NA	Several square feet of ground disturbance. Most work is on the pole near the wires and does not impact the ground.
E8b. Utility/Wood Pole Replacement	0.00	0.80	500	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Estimate	Several square feet of ground disturbance.
E9b. Line Reconductoring (Distribution)	0.00	0.57	250	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Estimate	Limited ground disturbance. Most facilities are near roads, on shoulders.
E10a. Vegetation Management Routine Maintenance	0.00	1.84	20	Yes	No	No	No	Yes	No	No	No	No	NA	Limited ground disturbance. Applies to new subject poles.
E10b. Vegetation Management Pole Clearing	0.00	0.23	100	Yes	No	No	No	Yes	No	No	Yes	No	Estimate	Limited ground disturbance. Applies to new subject poles.
E10c. Vegetation Management Tree Removal – Small Groups	0.00	2.50	25	Yes	Yes	No	No	Yes	No	No	No	Yes	Estimate	Limited ground disturbance.
E10e. Vegetation Management Tower Cage Clearing	0.04	0.29	8	Yes	Yes	No	No	Yes	No	No	No	No	NA	Limited ground disturbance.
E10f. Vegetation Management Fee Strip Maintenance	3.03	3.03	1	Yes	Yes	No	No	Yes	No	No	No	No	NA	Mowing of fee lands by regulation.
E11a. Wood Pole Test and Treat – Inspection and Maintenance	0.00	1.24	6000	Yes	Yes	No	No	No	No	No	No	No	NA	Several square feet of ground disturbance.
E11b. Wood Pole Test and Treat – Reinforcement	0.00	0.15	180	Yes	Yes	No	Yes	No	No	No	No	Yes	Estimate	Several square feet of ground disturbance.

HCP Table 5-3. Continued

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E15. Underground Line Construction	0.01	0.03	1	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Estimate	Most likely to be in urban areas.
Subtotal		**36.00**	**8,650**											
Medium activities (0.11 acre to 0.5 acre of impact)														
Gas														
G3a. Pipeline Remedial Maintenance (Ercon Mats)	0.11	0.11	1	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Restoration standard as part of additional permit requirements.
G10. Pipeline Coating Replacement	0.23	0.05	0.2	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G12. Pipeline Telecommunication Site Maintenance (New Cable)	0.34	0.34	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Minor excavation.
Electric														
E4. Substation Maintenance	0.46	0.46	1	Yes	Yes	No	No	No	No	No	No	No	NA	Mowing around facilities.
E12. New Distribution and Transmission Line Construction or Relocation (New Line and Access Road_	0.06	0.57	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Permanent impact from new access; mitigation at permanent impact ratios
E12. New Distribution and Transmission Line Construction or Relocation (Pull Site)	0.06	0.12	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Limited ground disturbance. Use existing disturbed areas where possible.
E12. New Distribution and Transmission Line Construction or Relocation (Staging)	0.13	0.26	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Limited ground disturbance.

HCP Table 5-3. Continued

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Medium activities (0.11 acre to 0.5 acre of impact) (continued)														
Electric (continued)														
E13. Tower Line Construction (Footings and Pull Sites)	0.17	1.09	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Use existing disturbed areas where possible.
Subtotal		**3.00**	**11.2**											
Large activities (0.51 acre or larger)														
Gas														
G9. Pipeline Lowering	2.42	0.80	0.3	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G11. Pipeline Replacement	2.42	12.41	5	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Less flexibility in making adjustments to work areas.
G13a. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	2.42	36.36	10	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Actual	Impacts in sensitive areas can be minimized.
G14. Gas Pressure Limiting Station Construction (Fencing)	0.00	0.11	0	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Actual	Less flexibility in making adjustments to work areas.
G14. Gas Pressure Limiting Station (Laydown Area)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G14. Gas Pressure Limiting Station (Excavation/Stock)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G15. New Customer/Business Pipeline Extension	0.06	2.48	1	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.
G16. PSEP – Existing Pipeline Replacement (In place)	1.21	19.39	8	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Less flexibility in making adjustments to work areas.

HCP Table 5-3. Continued

Activity	Average impact size of Covered Activity	Annual impacts	Annual Covered Activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Area	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Area	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Large activities (0.51 acre or larger) (continued)														
Gas (continued)														
G16. PSEP – Existing Pipeline Replacement (Relocation)	1.21	14.55	8	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.
G17. PSEP – Valve Replacement or Automation– (Fencing)	0.52	4.19	8	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.
G18. PSEP - Hydrostatic Testing (Excavation at end of pipeline)	0.09	0.46	5	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Less flexibility in making adjustments to work areas.
G18. PSEP - Hydrostatic Testing (Laydown)	0.92	0.92	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Impacts in sensitive areas can be minimized.
G18. PSEP - Hydrostatic Testing (Staging)	0.23	1.15	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Impacts in sensitive areas can be minimized.
Electric														
E9a. Line Reconductoring (Transmission)	2.87	29.1	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Impacts in sensitive areas can be minimized.
E10d. Vegetation Management Tree Removal – ROW Clearing	3.03	48.5	10	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Actual	Must maintain clearance distances. Selective clearing in riparian areas.
E14. Minor Substation Expansion	10.0	1.00	0.1	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Permanent impact from expansion.
Subtotal		**171.5**	**72.0**											
Total[c]		**210**	**8,733**											

Notes:

[a] Mitigation for permanent impacts indicates "no" if no impacts are expected.

[b] Mitigation for temporary impacts indicates "no" if site is so small it will recovery naturally.

[c] Average impacts multiplied by total activities may not sum to total annual impacts because of rounding and because frequency and size for temporary and permanent impacts have been combined.

8. Habitat Mitigation: PG&E will fund the acquisition, enhancement, management, and restoration of habitat by qualified third parties to mitigate and promote the recovery of Covered Species in the Bay Area. Proposed mitigation is subject to Service review and approval. Habitat preservation will be considered complete when the Service approves a conservation easement, a management plan, the endowment, and the easement holder. Habitat enhancement and restoration efforts may be implemented in partnership with local or regional land trusts where land is already protected but funding or management is lacking to promote species conservation and recovery.

Approach

PG&E will provide habitat mitigation in advance of impacts on Covered Species. PG&E will base its mitigation on acreages of estimated and actual habitat losses, and will adjust the timing of acquisitions based on forecasted habitat impacts and the amount of mitigation that has previously been implemented. The majority of all impacts will be from temporary disturbances. PG&E will provide mitigation for both permanent and temporary impacts on modeled habitat.

For many Covered Species, particularly broadly distributed species, most mitigation will be provided early in the permit term, with most mitigation provided 5 years, 10 years, or even 20 years in advance of impacts. For the Central California tiger salamander, California red-legged frog, and non-core Alameda whipsnake habitat, PG&E will provide mitigation in 5–year increments in advance of impacts. For some narrowly distributed species, PG&E will provide mitigation closer to the time of anticipated impacts. However, because the impacts on such species will be small, there may be an instance where a mitigation opportunity becomes available that meets the entire mitigation obligation for a species many years in advance of impacts, such as California freshwater shrimp.

Impacts on habitat will be mitigated with equivalent or higher-value habitat consistent with the land-cover and habitat data developed for the species that is described in Chapter 2 Environmental Setting. PG&E may provide habitat mitigation through the following mechanisms (in order of preference, although this may be modified subject to Service review and approval).

- Purchase of high-quality habitat.
- Purchase or placement of conservation easements on land appropriate for maintaining Covered Species corridors.
- Purchase of credits from approved mitigation or conservation banks.
- Partnerships with and/or contributions to existing conservation planning and recovery efforts.
- Placement of conservation easements on existing PG&E lands.
- Implementation of and contributions to recovery plan strategies.
- Habitat enhancement and restoration on lands already protected.

Determination of Habitat Mitigation Needs

The approach to quantifying habitat impacts for wildlife species involves the following:

- Describing O&M, minor new construction, and PSEP activities.

- Developing annual estimates of temporary and permanent habitat loss resulting from each Covered Activity using the estimated size of the Covered Activity and the estimated frequency with which it occurs in a given year.
- Quantifying the amount of modeled habitat by covered wildlife species, facility (i.e., major line of business) and percent of overall Plan Area to determine what percent of the different facility corridors are located within modeled habitat and thereby the extent of impacts that may result across the Plan Area.
- Estimating potential habitat impacts based on the proportion of the facility corridor that falls within the modeled habitat of each covered wildlife species.
- Estimating potential habitat impacts on critical habitat for Covered Species that have critical habitat.

For plant species covered under the HCP, the analysis was based on CNDDB record review, aerial photo review of known populations, and site-specific surveys.
HCP Table 4-1 (found on page 74 of this opinion) provides potential annual temporary and permanent impacts anticipated to occur as a result of implementing the Covered Activities.

Over the permit term, PG&E will adjust the amount of habitat mitigation required to reflect the difference between the estimated and the actual habitat loss for Covered Species. The overall intent is to ensure appropriate mitigation is provided in advance of the impact, as discussed in greater detail in Chapter 6, Plan Implementation and Funding.

PG&E does not intend to mitigate temporary disturbance of urban, barren, ruderal, row crop, orchard, or vineyard lands because these lands are unsuitable for Covered Species and undergo regular disturbance comparable in intensity to, or more extensive than, the impacts of O&M activities. In the event that one of these areas is determined by a PG&E biologist to be suitable for a Covered Species, the impacts associated with Covered Activities in that specific area will be mitigated. Conditions resulting from O&M activities will be consistent with existing conditions on agricultural fields and developed or disturbed lands.

Mitigation for Permanent Impacts

PG&E will mitigate permanent impacts on modeled habitat for Covered Species at a 3:1 ratio (3 acres mitigated for every 1 acre permanently affected). PG&E will provide mitigation for permanent impacts on a specific location only once during the duration of the HCP even if subsequent impacts occur in the same location.

Mitigation for Temporary Impacts

PG&E will offset temporary impacts on Covered Species by mitigating at the following ratios:

- For impacts on all covered invertebrates, Sonoma California tiger salamander, San Francisco garter snake, California Ridgway's rail, and salt marsh harvest mouse, a mitigation ratio of 1:1 will be used to mitigate temporary impacts on modeled habitat for these species.
- Temporary impacts on breeding habitat for California tiger salamander (both Central California and Sonoma County DPSs) and California red-legged frog will be mitigated at a 1:1 ratio.

- Temporary impacts within all critical habitat units for all Covered Species will be mitigated at a 1:1 ratio.
- Temporary impacts on modeled upland habitat for Central California tiger salamander will be mitigated at a ratio of 0.5:1 when mitigation is provided in 5-year increments in advance of impacts. For the first 5 years, mitigation that is not in place prior to any impact will be at a 1:1 ratio.
- Temporary impacts on modeled upland (dispersal) habitat for California red-legged frog will be mitigated at a ratio of 0.5:1 when mitigation is provided in 5-year increments in advance of impacts. For the first 5 years, mitigation that is not in place prior to any impact will be at a 1:1 ratio.
- Temporary impacts on non-core (movement or dispersal) habitat for Alameda whipsnake will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of impacts. For the first 5 years, mitigation that is not in place prior to any impact will be at a 1:1 ratio.
- A mitigation ratio of 1:1 will be used to mitigate temporary impacts on Alameda whipsnake core or perimeter core habitat.
- Temporary impacts on low-quality/use modeled habitat for San Joaquin kit fox will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of the impact. If the mitigation is not in place in advance of the impact, the ratio will be 1:1.
- A mitigation ratio of 1:1 will be used for temporary impacts on core modeled habitat for San Joaquin kit fox.

These ratios are appropriate based on the types of habitat impacts and timing of mitigation. Mitigation ratios for California tiger salamander, California red-legged frog, and Alameda whipsnake are appropriate for species with broader distributions where the majority of impacts are the result of temporary disturbances. PG&E intends to acquire mitigation in advance of impacts to ensure the biological goals and objectives are met; however, should PG&E be unable to fulfill its mitigation commitments in advance of impacts on the Central California tiger salamander, California red-legged frog, and Alameda whipsnake (non-core habitats), the mitigation ratio for these species will increase to 1:1 until mitigation is again provided in advance of impacts.

HCP Table 4-1. Estimated Acreages Disturbed by Bay Area O&M HCP Covered Activities[a]

Activity	Annual Frequency[b]	Average Activity Size (acres)	Permanent			Temporary		
			Permanent Loss (PL) per Activity (acres)	Annual Permanent Loss (PL)[c] (acres)	30-Year Permanent Loss (PL) (acres)	Temporary Loss (TL) per Activity (acres)	Annual Temporary Loss (TL) (acres)	30-Year Temporary Loss (TL) (acres)[d]
Gas								
G1. Patrols[e]	1	0	–	–	–	–	–	–
G2. Inspections	1	0	–	–	–	–	–	–
G3a. Remedial Maintenance – Fencing	10	0.06	0.06	0.57	28.5	0.06	0.57	28.5
G3a. Remedial Maintenance – Ergon Mats	1	0.11	0.11	0.11	5.5	–	–	–
G3b. Internal Pipeline Inspection	50	0.06	–	–	–	0.06	2.98	149
G4. Compressor Station Upgrades and Maintenance	1	0.28	–	–	–	0.28	0.28	14
G5. Pipeline ETS Installations	7	0.06	–	–	–	0.06	0.40	20
G6. Valve Maintenance	5	0	–	–	–	–	–	–
G7. Valve Maintenance – Replacement or Automation	5	0	–	–	–	–	–	–
G8. Pipeline Cathodic Protection	5	0.02	–	–	–	0.02	0.11	5.5
G9. Pipeline Lowering	0.33	2.42	–	–	–	2.42	0.80	40
G10. Pipeline Coating Replacement	0.20	0.25	–	–	–	0.25	0.05	2.5
G11. Pipeline Replacement	5	0.06/2.42	0.06	0.29	14.5	2.42	12.12	606
G12. Telecom Site Maintenance	1	0.34	–	–	–	0.34	0.34	17
G13a. Pipeline ROW Vegetation Management	10	1.21/2.42	1.21	12.12	606	2.42	24.24	1,212
G13b. Pipeline Access Road Management	5	0.01	–	–	–	0.01	0.05	2.5
G14. Gas Pressure Limiting Station Construction	0.20	0.55/0.23	0.55	0.11	5.5	0.45	0.09	4.5
G15. New Customer Pipeline Installation	1	2.42/0.06	2.42	2.42	121	0.06	0.06	3.0
G16. Pipeline Modernization and Replacement—Pipeline Replacement	8	0.61-1.21/1.21	1.82	14.55	727.5	2.38	19.00	950

HCP Table 4-1. Continued

Activity	Annual Frequency[b]	Average Activity Size (acres)	Permanent			Temporary		
			Permanent Loss (PL) per Activity (acres)	Annual Permanent Loss (PL)[c] (acres)	30-Year Permanent Loss (PL) (acres)	Temporary Loss (TL) per Activity (acres)	Annual Temporary Loss (TL) (acres)	30-Year Temporary Loss (TL) (acres)[d]
Gas (continued)								
G17. Pipeline Modernization and Replacement—Valve Replacement or Automation	8	0.06/0.52	0.01	0.06	3	0.52	4.13	206.5
G18. Pipeline Modernization and Replacement—Hydrostatic Testing	5	0.09-0.92	–	–	–	0.51	2.53	126.5
E1. Patrols	1	0	–	–	–	–	–	–
E2. Inspections	1	0	–	–	–	–	–	–
E3. Insulator Washing or Replacement	1	0	–	–	–	–	–	–
E4. Substation Maintenance	1	0.46	–	–	–	0.46	0.46	23
E5. Outage Repair	500	0.01	–	–	–	0.01	5.56	278
E6a. Tower Replacement or Repair (including Telecommunication Attachments)	360	0.02	–	0.41	20.5	0.02	8.26	413
E6b. Boardwalk Repair and Replacement	15	0.002	–	–	–	–	0.03	1
E7. Facility Installations (Shoo-Fly)	100	0.06	–	–	–	0.06	5.74	287
E8a. Pole & Equipment Repair or Replacement	500	0	–	–	–	–	–	–
E8b. Utility/Wood Pole Replacement	500	0.002	–	–	–	–	0.80	40
E9a. Line Reconductoring – Transmission	10	0.01/2.87	0.04	0.36	18	21.52	215.22	10,761
E9b. Line Reconductoring – Distribution	250	0.002	–	–	–	–	0.57	28.5
E10a. Veg. Mgmt.—Routine Maintenance	20	0.09	0.09	1.84	92	–	–	–
E10b. Veg. Mgmt.—Pole Clearing	100	0.002	–	0.23	11.5	–	–	–

HCP Table 4-1. Continued

Activity	Annual Frequency[b]	Average Activity Size (acres)	Permanent			Temporary		
			Permanent Loss (PL) per Activity (acres)	Annual Permanent Loss (PL)[c] (acres)	30-Year Permanent Loss (PL) (acres)	Temporary Loss (TL) per Activity (acres)	Annual Temporary Loss (TL) (acres)	30-Year Temporary Loss (TL) (acres)[d]
Gas (continued)								
E10c. Veg. Mgmt.—Removal Activities	25	0.1	0.10	2.50	125	–	–	–
E10d. Veg. Mgmt.—Transmission Vegetation/ROW Management	10/2	3.03/9.09	3.03	30.30	1,515	1.88	18.80	940
E10e. Cage Clearing—Electric Transmission Structures	8	0.04	–	–	–	0.04	0.29	14.5
E10f. Fee Strip Maintenance—Electric Transmission Line ROW	1	3.03	–	–	–	3.03	3.03	151.5
E11a. Wood Pole Test and Treat—Inspection and Maintenance	6,000	0.0002	–	–	–	0.0002	1.24	62
E11b. Wood Pole Test and Treat—Reinforcement	180	0.0008	–	–	–	0.0008	0.15	7.5
E12. New Distribution and Transmission Line Construction or Relocation	2	0.23/0.06-0.13	0.23	0.46	23	0.25	0.49	24.5
E13. Elec. Tower Line Construction	2	0.06/0.17	0.29	0.57	28.5	0.26	0.52	26.0
E14. Minor Substation Expansion	0.10	10.0	10.00	1.00	50	–	–	–
E15. Elec. Underground Line Construction	0.10	0.01	–	–	–	0.30	0.03	1.5

[a] In using modeled habitat, the main assumption is that disturbance areas would be distributed uniformly throughout PG&E facilities by facility type because exact Covered Activity work locations are unknown. Total impacts cannot be derived by multiplying the frequency of activities by the acres affected per activity because not all impacts will t occur uniformly over the permit term.

[b] This number represents the projected average annual frequency. The number of activities conducted annually is expected to vary. Some Covered Activities, particularly those related to gas pipeline replacement and vegetation management ROW maintenance (G15, G1, G17, and E10d), would be implemented predominately in the first 8 years of the permit.

[c] See Section 4.1.1 *Definitions of Permanent and Temporary Impacts.*

[d] Patrols occur at either 6-month or 12-month intervals, but because patrols may be performed on foot, with aircraft, or with vehicles; the impact calculation assumes that the entire gas pipeline is patrolled one time each year.

Mitigation Summary for Wildlife

PG&E's mitigation for covered wildlife is described in HCP Table 5-4 (page 81 of this opinion). Wildlife mitigation is grouped according to those species that may co-occur, though site-specific assessments will provide information on the habitat suitability and suite of species that will benefit from a specific mitigation acquisition. Specific mitigation options are highlighted in the columns on the right of HCP Table 5-4 and will be subject to review and approval by the Service, as described in the *Mitigation Approval Process* section below. As an important note, mitigation totals are not additive because there will be some overlap between species (i.e., summing totals without factoring in overlap leads to a larger mitigation requirement). Additional information on mitigation locations and priorities can be found in the Section titled *Location of Mitigation Areas* below.

Overall, PG&E will develop a comprehensive mitigation program that both mitigates PG&E impacts and contributes to regional conservation or recovery efforts. PG&E will work with the Service to prioritize mitigation opportunities that meet both conservation priorities and recovery goals. PG&E will consider the regional allocation of mitigation between the North Bay, East Bay, South Bay and the San Francisco Peninsula in relation to overall impacts on species, and it will follow these basic conservation biology principles as it evaluates mitigation options.

- Patch size:
  - Large patches are better than small patches.
  - Connected patches are better than separated patches.
  - Unified patches are better than fragmented patches.
  - Nearness to other conserved lands is better than separation.
- Corridors:
  - Continuous corridors are better than fragmented corridors.
  - Wider corridors are better than narrow corridors.
  - Natural connectivity should be maintained or restored.

PG&E will focus on acquisitions that foster species conservation and recovery, and will work with other conservation partners to maximize regional conservation efforts. If mitigation compliance for narrow endemic species cannot be combined with larger mitigation acquisitions (i.e., there is no overlap), mitigation will be provided on small-scale sites consistent with PG&E's mitigation needs and subject to approval by the Service. A brief summary of the conservation strategy for each group of Covered Species is provided below.

Invertebrates: PG&E intends to acquire fee title or conservation easements, or will partner with regional conservation entities to advance conservation for most invertebrate species covered under the HCP. Secondarily, PG&E will seek to fund implementation of recovery actions with the approval of the Service. However, California freshwater shrimp has unique habitat requirements that are met only in Marin, Sonoma and Napa Counties; therefore, habitat for this species will be conserved in a recovery planning area within one of these three counties. PG&E will focus on one acquisition in Sonoma County because most facilities that cross habitat are in Sonoma County, and one parcel will maximize the conservation benefit to the species.

PG&E will mitigate impacts on conservancy fairy shrimp in Solano County by purchasing habitat by fee title, conservation easements, or conservation bank credits. For longhorn fairy shrimp, PG&E will work with the East Contra Costa HCP/NCCP implementing agency to

explore ways to meet mutual conservation objectives. If this approach is not possible, PG&E will seek partners, such as the East Bay Regional Park District, to conserve lands for the species.

Vernal pool fairy shrimp and vernal pool tadpole shrimp have a broader distribution and could occur in Solano, Contra Costa or Alameda Counties. Impacts on Delta green ground beetle will be mitigated primarily within occupied habitat in Solano County. PG&E will acquire wetted habitat as well as some of the swale systems and surrounding upland habitat to protect the vernal pool species. PG&E will purchase conservation easements or obtain fee title for these species from willing sellers, or will acquire credits from mitigation banks.

Butterflies are grouped together by similar habitat requirements. Mitigation for impacts on butterfly species will focus on conserving habitat within their respective dispersal ranges. Some covered butterfly species, such as the Mission blue butterfly and San Bruno elfin butterfly, have unique habitat needs and only occur in San Mateo County. Therefore, PG&E will focus its conservation efforts on the Peninsula and work to fund conservation efforts in and around San Bruno Mountain, where PG&E will focus on partnering opportunities with the San Bruno Mountain HCP habitat manager, HCP trustees, and the Service. In contrast, the Callippe silverspot butterfly has a much broader distribution with habitat in the eastern and western portions of the study area. PG&E may direct some mitigation toward Solano, Contra Costa or Alameda Counties, and toward other HCP recovery efforts (e.g., San Bruno Mountain HCP). PG&E may also partner with the Solano County Water Agency to meet mutually beneficial HCP mitigation needs of the two organizations by enhancing habitat within Solano County (e.g., Solano Land Trust lands). In the event conservation lands are not available, PG&E will fund other recovery efforts that are approved by the Service.

For the Lange's metalmark butterfly, PG&E will place a conservation easement on a portion of its property or, with agency approval, will contribute funds for habitat management at Antioch Dunes National Wildlife Refuge. For the Bay checkerspot butterfly, PG&E is looking toward conservation of suitable habitat but may also work with others to conserve lands and may contribute funds in a way that directly benefits the species (e.g., habitat management and species reintroductions).

Amphibians: The Central California tiger salamander is the primary species driving the conservation strategy for the HCP. This species requires more mitigation than all other species because its habitat is the most extensive throughout the Plan Area. PG&E's conservation strategy is to acquire fee title or conservation easements, or partner with other regional conservation entities to advance conservation for most covered amphibian and reptile species. PG&E will focus on lands in Contra Costa, Alameda, Solano, and Santa Clara Counties, and explore the possibility of contributing funds to regional conservation efforts for these species (i.e., East Contra Costa HCP/NCCP, Santa Clara Valley Habitat Plan). PG&E may partner with a conservation banker or other conservation entity to prepare turn-key mitigation, or PG&E may buy credits from a mitigation bank. Because PG&E infrequently impacts this species breeding habitat, it will provide limited breeding habitat as mitigation. However, to ensure overall habitat connectivity and suitability, PG&E will ensure mitigation lands are located near stock ponds, vernal pools, or other breeding habitat. PG&E will implement mitigation in advance of impacts on Central California tiger salamander dispersal habitat.

To mitigate for impacts on Sonoma California tiger salamanders in Sonoma County, acquisitions will be consistent with the Santa Rosa Plain Conservation Strategy. PG&E will focus its

acquisition efforts on areas that are targeted for conservation, are likely to be occupied by California tiger salamander, and that would provide important corridor habitat for the species. PG&E owns some fee title lands in this area and may record a conservation easement on a portion of the land for species protection and management.

PG&E will use multiple conservation mechanisms to protect and enhance California red-legged frog habitat. Approximately 60 percent of impacts will result in the eastern portion of the Plan Area in Solano, Contra Costa, and Alameda Counties. Another 30 percent of impacts will result in the western and southern portions of the Plan Area in Contra Costa and San Mateo Counties, and 10 percent in the northern portion of the Plan Area in Marin, Sonoma, and Napa Counties. Mitigation will similarly be distributed in these regional areas. Additional conservation mechanisms could include contributing to the protection and enhancement of previously identified parcels (e.g., Swett Ranch) or contributing to the conservation, protection, and enhancement efforts of other entities (e.g., San Francisco Public Utilities Commission (SFPUC) or Mid-Peninsula Open Space and Conservation District). When acquiring easements or lands, PG&E will prioritize sites that contain habitat for both California tiger salamander and California red-legged frog. PG&E expects that 30 percent of its mitigation for impacts on California red-legged frog could be combined with mitigation for impacts on California tiger salamander because California red-legged frog dispersal habitat overlaps with that of the California tiger salamander.

Modeled breeding habitat for California red-legged frog includes a buffer around riparian corridors; therefore, PG&E's mitigation for impacts on modeled breeding habitat will include a similar buffer. Riparian waterways contribute up to 5 percent of the modeled breeding habitat, and PG&E will mitigate for these impacts by preserving riparian habitat. PG&E will acquire mitigation in advance for impacts on California red-legged frog dispersal habitat.

Reptiles: PG&E will impact Alameda whipsnake in Contra Costa and Alameda Counties; therefore, PG&E will mitigate in these counties. PG&E will acquire lands or conservation easements in these counties or will contribute funds to the East Contra Costa HCP/NCCP implementing agency to support the purchase of habitat mitigation beyond that required in the East Contra Costa HCP/NCCP. Mitigation for impacts on core, perimeter core, and movement habitats for Alameda whipsnake may be combined with mitigation for impacts on the California red-legged frog and Central California tiger salamander depending on the habitat characteristics of the site being evaluated for mitigation. Because fewer acres of mitigation are required for Alameda whipsnake than California red-legged frog and Central California tiger salamander, PG&E may work with a regional conservation entity that is working to conserve the species, such as East Bay Regional Park District. PG&E will acquire mitigation in advance for impacts on Alameda whipsnake movement habitat.

San Francisco garter snake occurs primarily in San Mateo County; therefore, mitigation will be provided there. Because there is limited opportunities to acquire habitat for this species near San Francisco International Airport or Crystal Springs Reservoir, PG&E will pursue the possibility of conservation partnerships with airport management and SFPUC to determine if habitat management or enhancement is feasible. If this is not feasible, PG&E may pursue additional conservation actions with regional conservation organizations (e.g., Mid-Peninsula Open Space and Conservation District), or acquire conservation easements or fee title along riparian areas closer to the coast. Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.

Marsh Species: PG&E will conserve bay-fringe habitats to provide mitigation for impacts on the California Ridgway's rail and salt marsh harvest mouse. By moving tower footings during past projects and by supporting tidal marsh restoration in the South Bay, PG&E accumulated advance mitigation of 5 acres of habitat for these species. Further, PG&E will identify additional lands for easement or fee title acquisition. There are many bay-fringe habitat restoration projects under way, and PG&E will evaluate whether it is better to mitigate on its own property or partner with others to maximize the conservation benefits to these species. Approximately 30 percent of the mitigation for impacts on marsh species will be implemented in the South Bay, 50 percent in the East Bay, and 20 percent in the North Bay.

Grassland Species: PG&E will acquire and protect grassland in eastern Contra Costa, Alameda or Santa Clara Counties, or partner with a regional conservation entity (e.g., East Contra Costa County Habitat Conservancy) to offset impacts on the San Joaquin kit fox. This species' habitat is likely to co-occur with habitat for other Covered Species, such as the Central California tiger salamander, California red legged frog, or Alameda whipsnake. Because there are also multiple mitigation banks under development in this area, PG&E may buy credits from a mitigation bank as well.

HCP Table 5-4. Covered Wildlife Species Mitigation Groupings and Mitigation

	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total	
Covered Species	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation	Mitigation (acres)[a]	Specific Mitigation Options
California freshwater shrimp	0.3	3:1	**0.9**	2	1:1	**2**	**2.9**	1. Acquire fee title or conservation easement[b] in Marin, Sonoma, and/or Napa Counties. 2. Contribute funds for habitat management or restoration in other core areas on public or land trust lands.
Conservancy fairy shrimp	0.5	3:1	**1.5**	2	1:1	**2**	**3.5**	1. Purchase easement or credit in Solano County.
Longhorn fairy shrimp	0.1	3:1	**0.3**	1	1:1	**1**	**1.3**	1. Contribute funds to the East Contra Costa HCP/NCCP implementing agency.
Vernal pool mitigation								1. Acquire lands suitable for species and dedicate to a conservation organization.[c]
Vernal pool fairy shrimp	5	3:1	**15**	25	1:1	**25**	**40**	2. Acquire credits from mitigation banks in Solano County.
Vernal pool tadpole shrimp	5	3:1	15	25	1:1	25	40	
Delta green ground beetle	1	3:1	3	5	1:1	5	8	
Mission blue and San Bruno butterfly mitigation								1. Contribute funds to the San Bruno Mountain HCP implementing agency. 2. Contribute funds for habitat management.
Mission blue butterfly	2	3:1	6	20	1:1	20	26	
San Bruno elfin butterfly	2	3:1	**6**	20	1:1	**20**	**26**	

HCP Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Callippe silverspot butterfly	30	3:1	**90**	55	1:1	**55**	**145**	1. Acquire fee title or conservation easements in Solano, Contra Costa, or Alameda Counties. 2. Contribute funds to other regional HCPs. (Mitigation for impacts on this species may be combined with mitigation for impacts on Mission blue butterfly.) 3. Contribute to habitat enhancement and restoration efforts of Solano Land Trust.
Lange's metalmark butterfly	0.3	3:1	**0.9**	1	1:1	**1**	**1.9**	1. Place conservation easement on portion of PG&E property. 2. Contribute funds for habitat management at Antioch Dunes National Wildlife Refuge.
Bay checkerspot butterfly	4	3:1	**12**	62	1:1	**62**	**74**	1. Place conservation easement on property. 2. Contribute funds to the *Santa Clara Valley Habitat Plan* implementing agency. 3. Contribute funds for habitat management at Edgewood Natural Preserve, Santa Teresa County Park, or other appropriate sites.

HCP Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Central California tiger salamander	259	3:1	**777**	2,811	0.5:1[d]	**1,405**	**2,183**	1. Acquire lands or conservation easements in Contra Costa, Alameda, Santa Clara, and Solano Counties. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP and/or *Santa Clara Valley Habitat Plan* for the purchase of habitat mitigation beyond that required in those plans. 3. Acquire credits from mitigation banks. (Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.) PG&E will acquire mitigation in advance for impacts on this species' dispersal habitat.
	39 critical habitat	3:1	**117**	507 critical habitat	1:1	**507**	**624**	See above.
	2 modeled breeding habitat	3:1	**6**	25 modeled breeding habitat	1:1	**25**	**31**	See above.
Sonoma California tiger salamander	13	3:1	**39**	80	1:1	**80**	**119**	1. Acquire lands or conservation easements consistent with the *Santa Rosa Plain Conservation Strategy*. 2. Purchase mitigation credits.

HCP Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California red-legged frog	122	3:1	**366**	1,488	0.5:1[d]	**744**	**1,110**	1. Acquire lands or conservation easements primarily in Contra Costa, Alameda, and Santa Clara Counties. Also pursue a small amount in the North Bay. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP or the *Santa Clara Valley Habitat Plan* for purchase of habitat mitigation beyond that required in those plans. 3. Acquire credits from mitigation banks. 4. Utilize mitigation credits being developed in cooperation with the Solano Land Trust on Swett Ranch. 5. Contribute to conservation efforts by SFPUC or Mid-Peninsula Open Space and Conservation District. (Approximately 30 percent of mitigation may be combined with mitigation for impacts on Central California tiger salamander dispersal habitat.) PG&E will acquire mitigation in advance for impacts on this species' dispersal habitat.
	55 critical habitat	3:1	**165**	12 critical habitat	1:1	**12**	**177**	See above.

HCP Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California red-legged frog (continued)	42 modeled breeding habitat	3:1	**126**	377 modeled breeding habitat	1:1	**377**	**503**	95 percent of this area is composed of riparian habitat with approximately 5 percent (25 acres) as breeding habitat.
Alameda whipsnake	6 core and perimeter core habitat	3:1	**18**	83 core and perimeter core habitat	1:1	**83 core**	**101**	1. Acquire lands or conservation easements in Contra Costa, Alameda, and Santa Clara counties. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP and/or *Santa Clara Valley Habitat Plan* for the purchase of habitat mitigation beyond that required in those plans. (Mitigation for impacts on this species may be combined with mitigation for impacts on Central California tiger salamander and California red-legged frog dispersal habitat.)
	27 movement habitat	3:1	**81**	329 movement habitat	0.5:1[d]	**164**	**245**	See above. PG&E will acquire mitigation in advance for impacts on this species' movement habitat.
San Francisco garter snake	4	3:1	**12**	26	1:1	**26**	**38**	1. Pursue partnerships for conservation on the Peninsula. 2. Contribute funds for habitat management in other core areas on public or land trust lands. Potential partners include SFPUC and Mid-Peninsula Open Space and Conservation District. (Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.)

HCP Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Salt marsh mitigation								1. Acquire lands or conservation easements in bay-fringe habitats.
Salt marsh harvest mouse	3.7	3:1	11	35	1:1	35	**46**	2. Contribute to South Bay or other tidal marsh restoration projects including the possible use of PG&E's parcel of tidal marsh habitat in Solano County.
California ridgway's rail	3.4	3:1	10.2	34	1:1	34	44	
San Joaquin kit fox								
	37 core habitat	3:1	**159**	426 core habitat	1:1	**426**	**585**	1. Acquire and protect grassland mitigation area in eastern Contra Costa, Alameda, or Santa Clara Counties. 2. Contribute funds to the East Contra Costa HCP/NCCP implementing agency. (Mitigation for impacts on this species may be combined with mitigation for impacts on other species.)
	16 low quality/ use habitat[e]	1:1	**16**	264 low quality/ use	0.5:1[d]	**132**	**148**	See above.

SFPUC = San Francisco Public Utilities Commission

Notes:

[a] For species that are grouped or have multiple habitat categories, the boldface number indicates the total acreage that will be mitigated. For total mitigation acreages and cost see Chapter 6, *Plan Implementation and Funding*.

[b] Conservation easements and fee title lands acquired for mitigation will also require an endowment to fund ongoing monitoring and management.

[c] Mitigation for impacts on wetlands will also include either a restoration or creation component.

[d] Assumes mitigation is provided in advance. A mitigation ration of 1:1 will be required if mitigation is not provided in advance of impacts.

[e] Low-quality/low-use modeled habitat was identified based on the low-quality habitat criteria developed under other regional conservation plans. Low-quality/low-use modeled habitat represents areas with greater slopes and unsuitable movement corridors, and contain habitat that has been otherwise degraded or is marginally suitable for kit fox use.

Mitigation Summary for Plants

Unlike mitigation for wildlife that may be implemented far in advance of impacts, mitigation for direct impacts on plant is likely to be determined just prior to the Covered Activity taking place (usually weeks or months prior to Covered Activities), and is most likely to be implemented after an activity is completed and based on the success of restored habitat. Habitat could be restored onsite in a ROW or offsite on protected lands as a potential means to mitigate for impacts on plants. However, mitigation will be challenging for covered plants because of the limited availability of occupied plant habitat. While there may be some opportunities to concurrently mitigate in some areas for impacts on plant and wildlife species (e.g., plants in vernal pool systems), onsite restoration and partnerships that promote plant recovery and conservation offer greater conservation benefits for covered plant species than acquisition.

HCP Table 5-5 (page 89 of this opinion) provides a summary of the conservation strategy for covered plants. Map Book zones and actual site-specific data on plant locality will determine the acreage of impact and the number of plants that could be taken. For small activities where additional surveys or monitoring are not conducted, acreages may serve as a surrogate for assessing take and mitigating impacts. For larger activities where additional surveys and monitoring are routinely conducted, the number of individual plants or colony size will be the preferred unit of measure for assessing impacts and determining the appropriate mitigation. However, when annual plants cannot be surveyed during the appropriate times of year, PG&E will use acreage as a surrogate to estimate the amount of impacts on covered annual plant species.

Permanent impacts on occupied plant habitat are expected to occur less frequently than temporary impacts because new or replacement facilities and temporary work spaces can be sited outside of these sensitive areas. HCP Table 5-5 provides the estimated number of plants that could be taken over the permit term. PG&E will implement the following mitigation for impacts on covered plant species.

- For permanent impacts, PG&E will provide mitigation in one of the following ways.
  - For every perennial or manzanita plant that is permanently affected, PG&E will provide mitigation at a 3:1 ratio (3 plants grown or protected for every 1 plant permanently affected). In addition, the general acres of habitat affected will be similar to the mitigation area.
  - For every acre of permanent impacts, PG&E will provide mitigation at a 3:1 ratio.
- For temporary impacts, PG&E will provide mitigation in one of the following ways.
  - For every perennial or manzanita plant species that is temporarily affected, PG&E will provide mitigation at a 1:1 ratio (1 plant grown or protected for every 1 plant temporarily affected).
  - For every acre of temporary impacts, PG&E will provide mitigation at a 1:1 ratio.

If impacts on perennial species are unavoidable, PG&E will salvage individual plants in advance of the impact and replant them within the ROW. Similarly, if impacts on annual plant species are unavoidable, PG&E will salvage topsoil and replace it within the ROW. PG&E will monitor the success of the replanting of perennial species and recovery of annual species for 3 years, unless the species is shown to have recovered sooner. If during this time the number of individual plants is not equal to or within normal variation of the number of individuals originally removed, PG&E will pursue other mitigation options to ensure biological goals are met. For perennial

species, an option is to propagate replacement stock and plant it within suitable habitat within the ROW. For annual plant species, these options vary based on the type of habitat and the availability of mitigation opportunities.

- Wetland plant species – purchase easements or land that benefits plants and consistent with acquisitions made for wildlife species.
- Annual plant species – partner with other organizations that are working to enhance and restore habitat for rare or endangered plants.
- Serpentine endemic species – contribute funds to efforts that will promote and protect listed plant species in Santa Clara County.

For activities affecting more than 0.1 acre in Map Book zones and for which AMMs are ineffective or unable to be implemented, PG&E will submit a restoration plan that includes the following information: an assessment of the impact site; methods for collecting, storing, or propagating plant material from the impact site; information on site preparation and reintroduction of collected plant material; measurable success criteria that can be achieved within a 3 year period; adaptive management measures to ensure the desired success criteria are achieved; monitoring and reporting methods and schedules; funding source and responsible parties; and the acreage or number of individuals expected to benefit from implementing the restoration plan.

Additional measures could include relocating facilities away from occupied habitat on a case-by-case basis as allowable by the operations groups and subject to landowner approval or removing noxious weeds to expand habitat for annual species. If a conservation easement is not feasible for these lands because private owners are unwilling, PG&E will comply with the success criteria to ensure the population persists. Service-approval of the plan and success criteria will be required.

HCP Table 5-5. Plant Impacts and Mitigation Approach

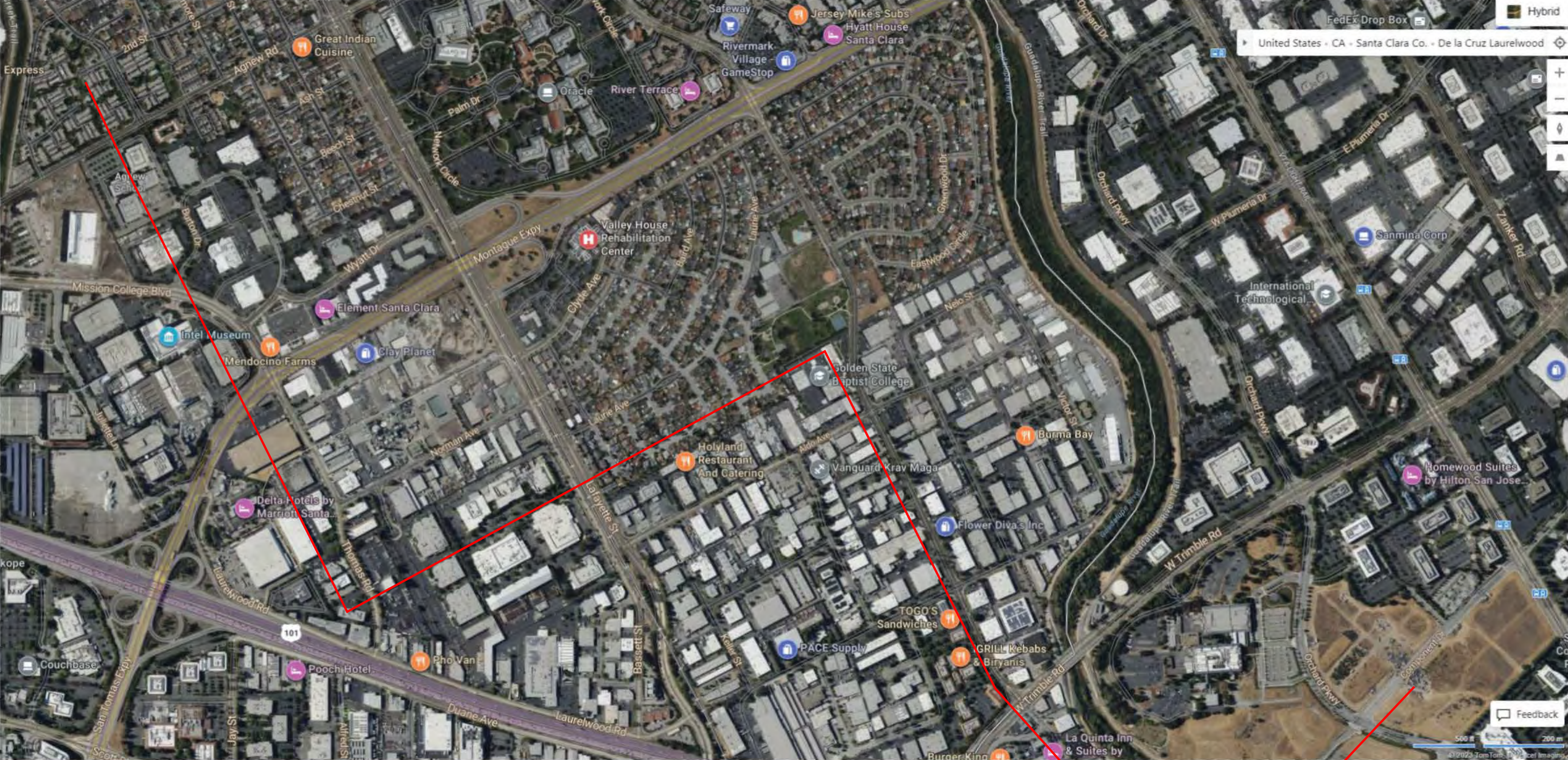
Plant Species	Documented CNDDB Habitat (acres)	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Pallid manzanita	159	2.27	15	1. Salvage and replant as a component of ROW restoration, plus monitor success.
Sonoma sunshine	501	2.5	250,000	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the *Santa Rosa Plain Conservation Strategy*. 3. Acquire lands or conservation easements consistent with the *Santa Rosa Plain Conservation Strategy*. 4. Purchase mitigation credits.
Coyote ceanothus	436	7.04	2,500	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Partner with *Santa Clara Valley Habitat Plan* implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the *Santa Clara Valley Habitat Plan*.
Fountain thistle	39	0.8	100	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.
Santa Clara Valley dudleya	1,560	3.84	800	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Propagate replacement stock and transplant into ROW locations with suitable habitat, plus monitor to determine success. 3. Partner with *Santa Clara Valley Habitat Plan* implementing agency to enhance restoration efforts. 4. Acquire lands or conservation easements consistent with the *Santa Clara Valley Habitat Plan*.
Contra Costa wallflower	54	0.17	35	1. Establish a conservation easement on PG&E lands at Antioch Dunes National Wildlife Refuge. 2. Coordinate with the Service to fund habitat restoration activities or propagation and transplantation activities.
Marin dwarf flax	436	1.95	1,700	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.

HCP Table 5-5. Continued

Plant Species	Documented CNDDB Habitat (acres)	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Burke's goldfields	667	1.51	2,000	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the *Santa Rosa Plain Conservation Strategy*. 3. Acquire lands or conservation easements consistent with the *Santa Rosa Plain Conservation Strategy*. 4. Purchase mitigation credits.
Contra Costa goldfields	507	5.48	14,539	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the Solano HCP. 3. Acquire lands or conservation easements in Solano County. 4. Purchase mitigation credits.
Sebastopol meadowfoam	699	0.04	500	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Acquire lands or conservation easements consistent with the *Santa Rosa Plain Conservation Strategy*. 3. Purchase mitigation credits.
Antioch Dunes evening primrose	70	0.17	10	1. Establish a conservation easement on PG&E lands at Antioch Dunes National Wildlife Refuge. 2. Coordinate with the Service to fund habitat restoration activities or propagation and transplantation activities.
White-rayed pentachaeta	41	0.11	500	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.
Metcalf Canyon jewelflower	817	0.96	210	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor to determine success. 2. Partner with *Santa Clara Valley Habitat Plan* implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the *Santa Clara Valley Habitat Plan*.

ATTACHMENT HAZ DR-113

Figures 3.3-16 and 3.3-17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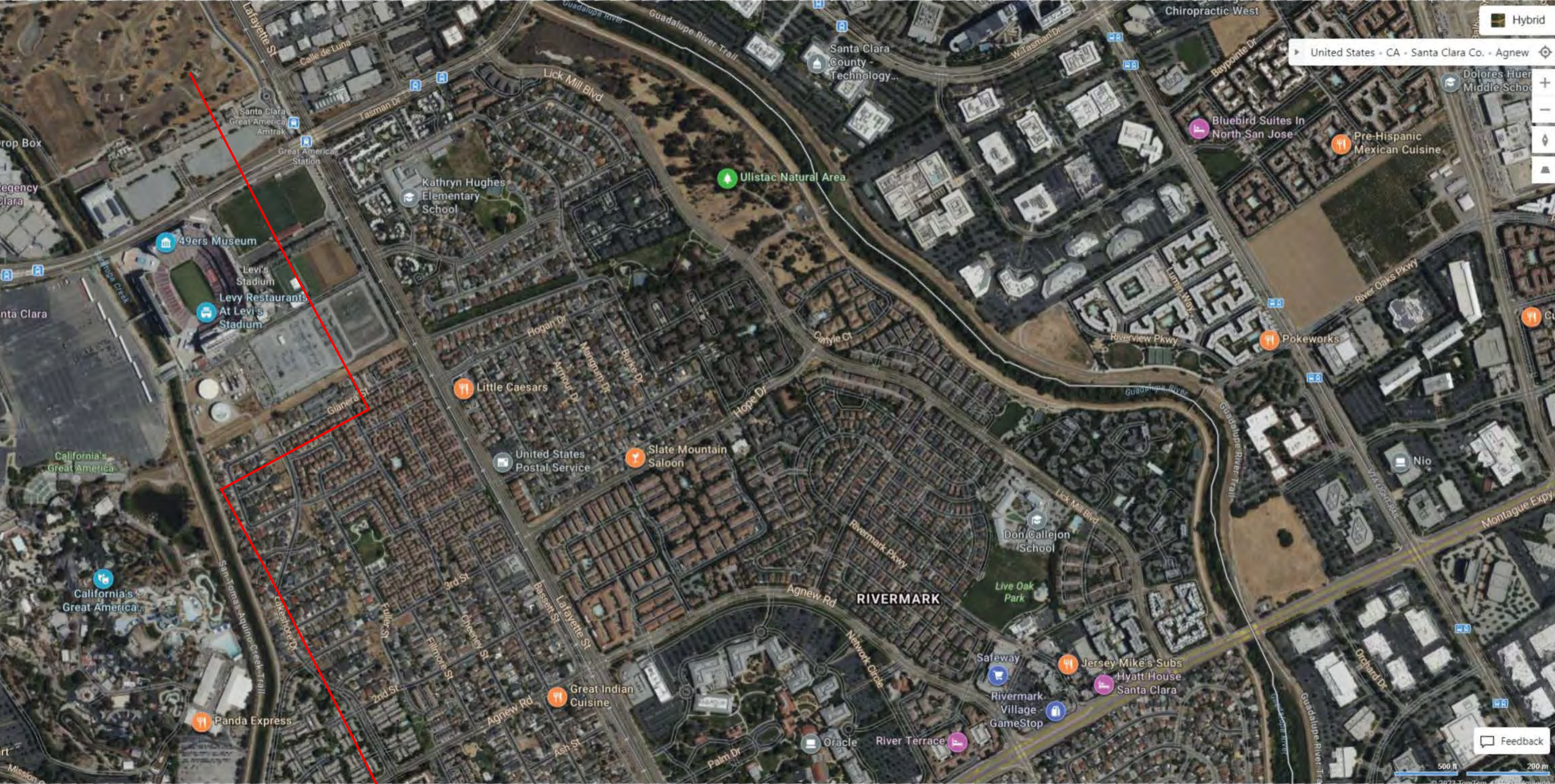
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Levy Restaurants At Levi's Stadium
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Armour Dr
Monogram Dr
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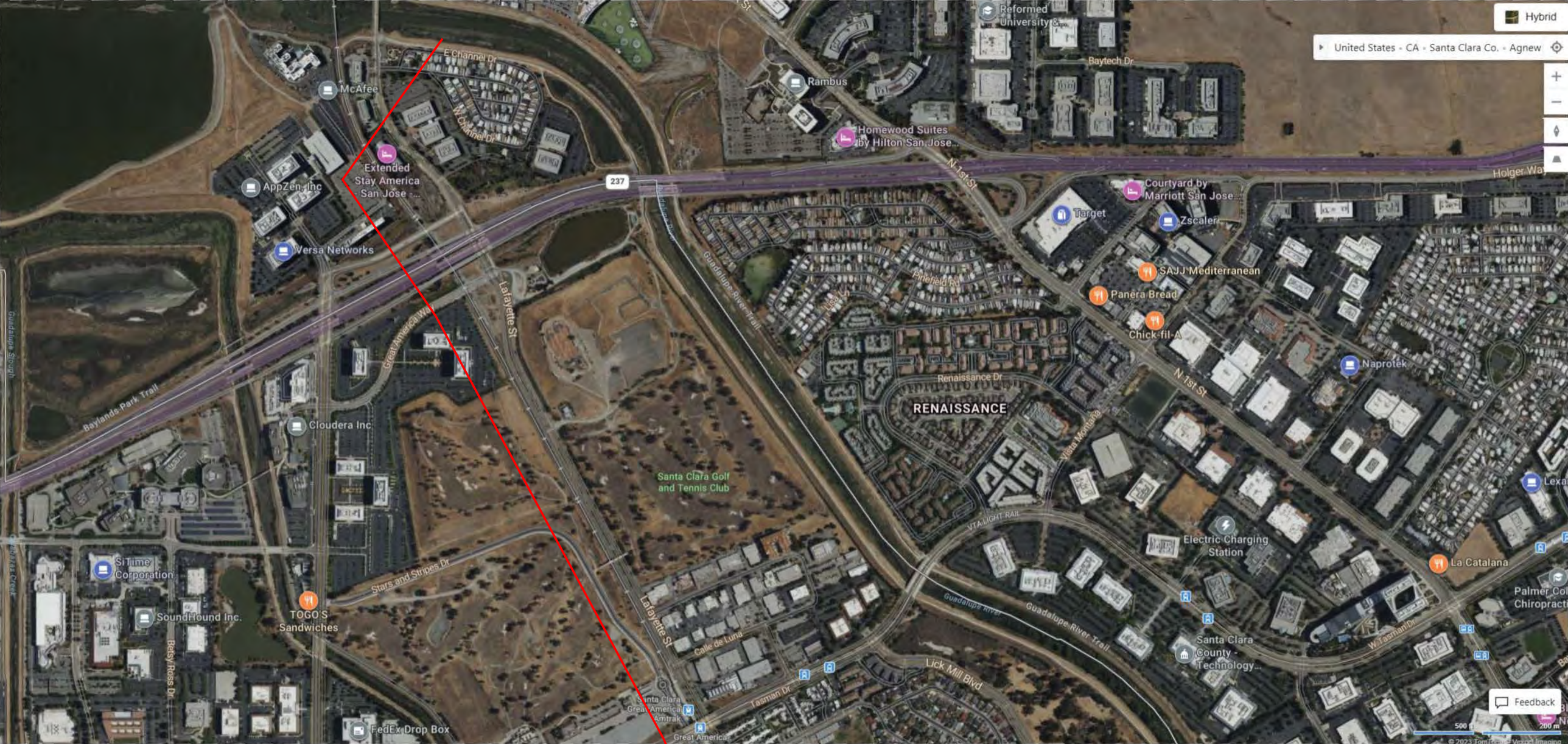
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Naprotek
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Baylands Park Trail
Guadalupe Slough
Renaissance Dr
RENAISSANCE
Vista Montana
Cloudera Inc
Santa Clara Golf and Tennis Club
VTA LIGHT RAIL
Electric Charging Station
La Catalana
SiTime Corporation
Stars and Stripes Dr
Sound Found Inc.
TOGO'S Sandwiches
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Zanker Ln
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Sprockets Ave
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Walbash St
Michigan Ave
Wilson Way
Desk Dr
Alviso Marina Park
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Alviso Branch Library
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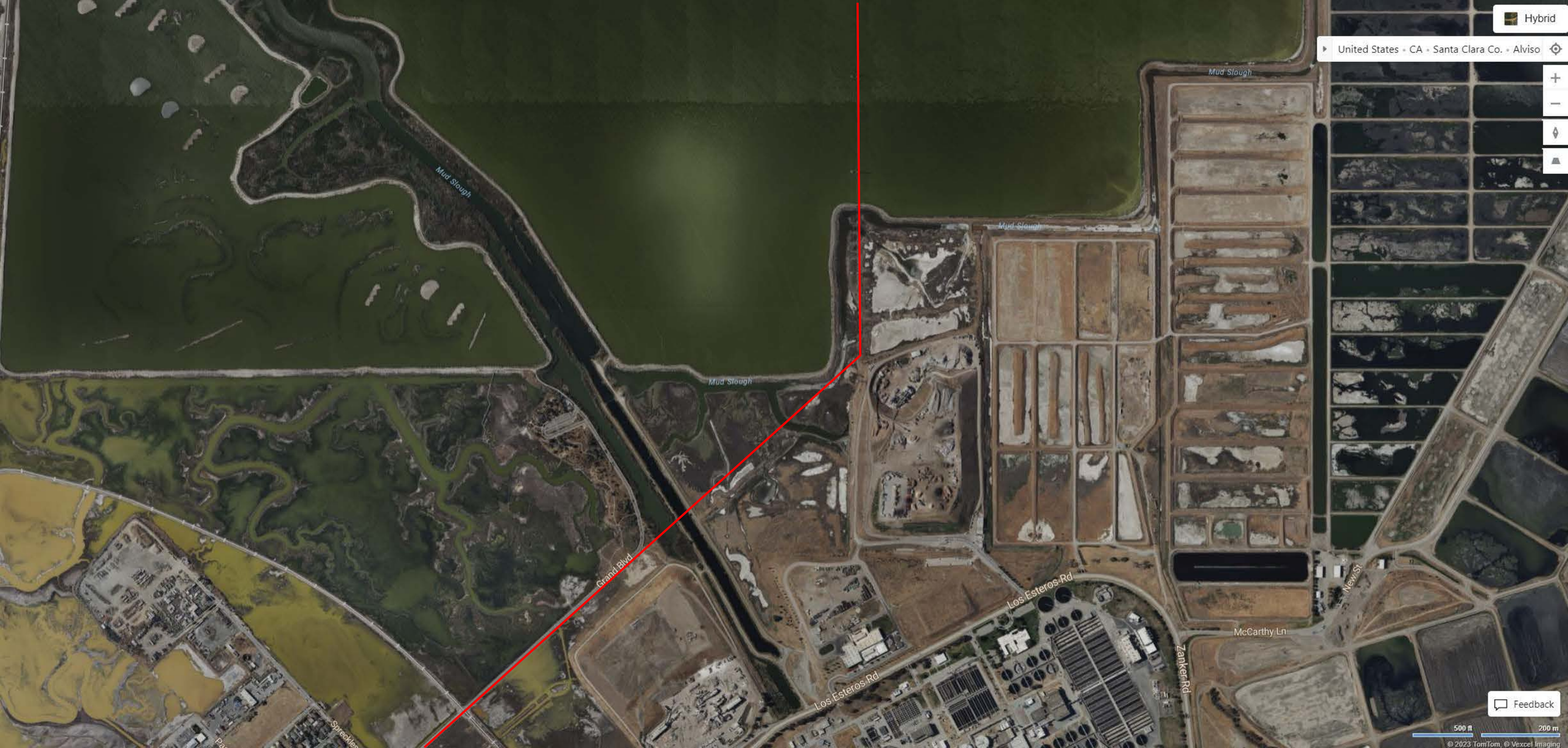
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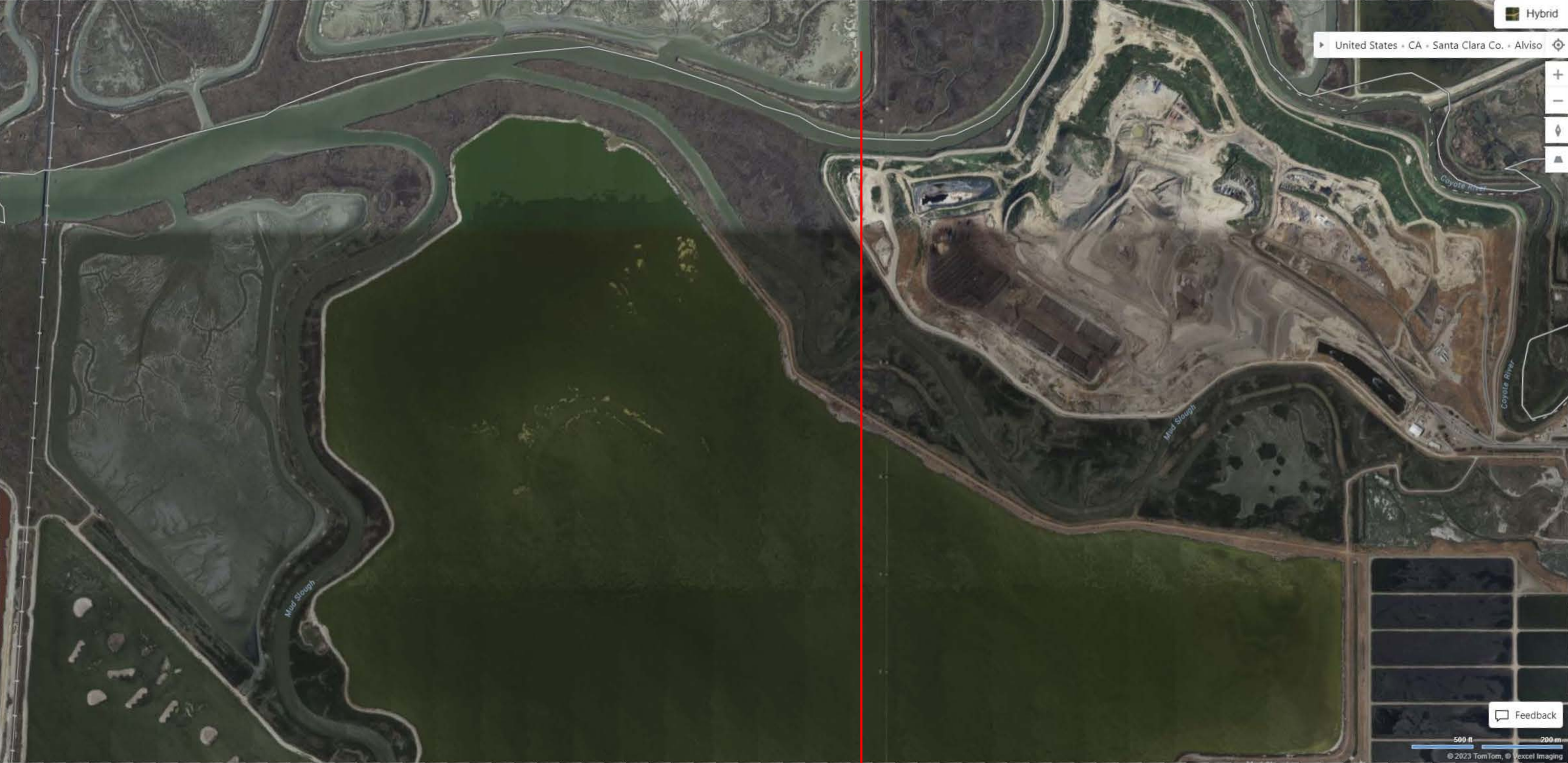
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Central
Admixture
Pharmacy
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Rahi Systems
TTI, Inc
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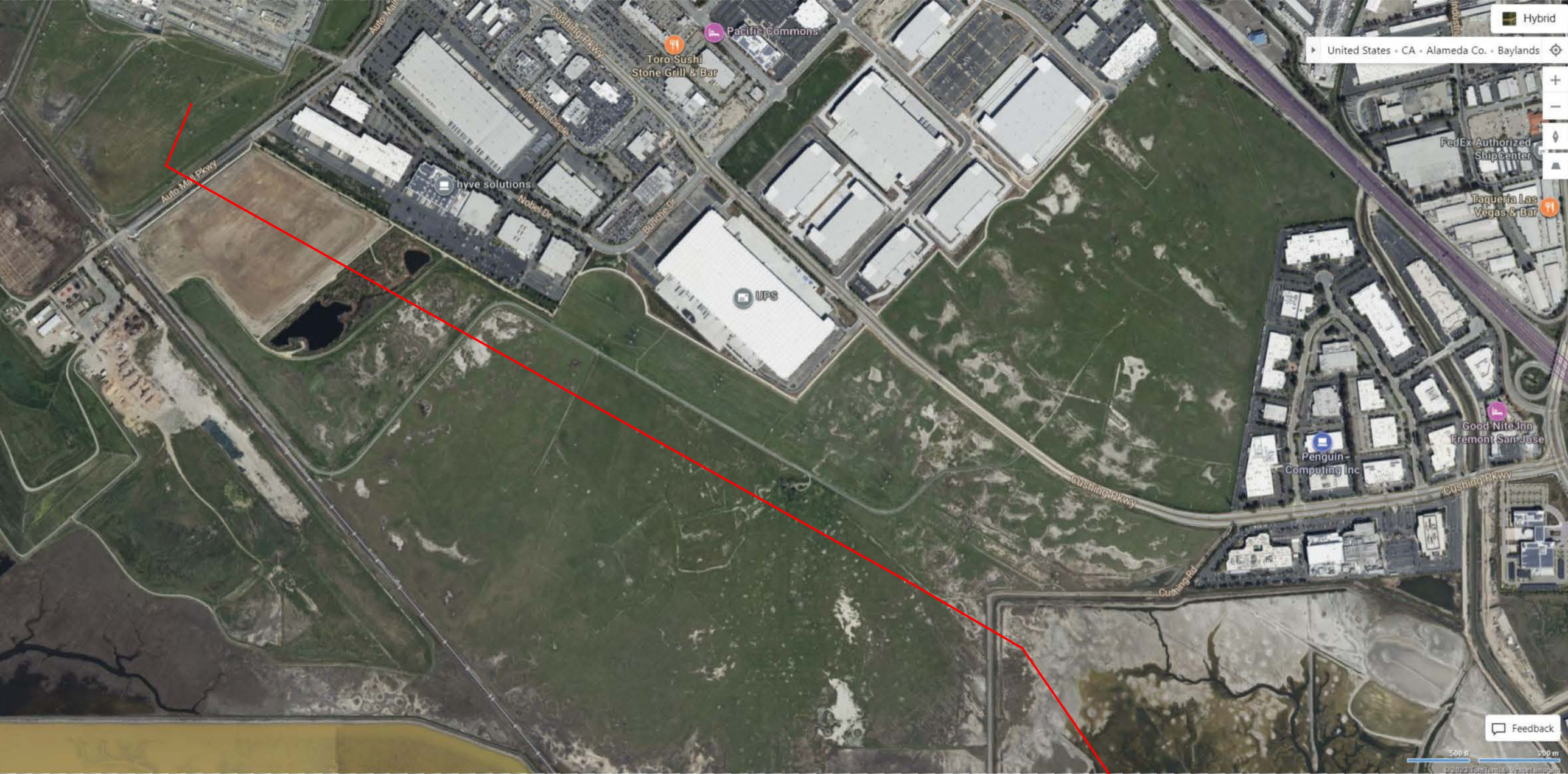
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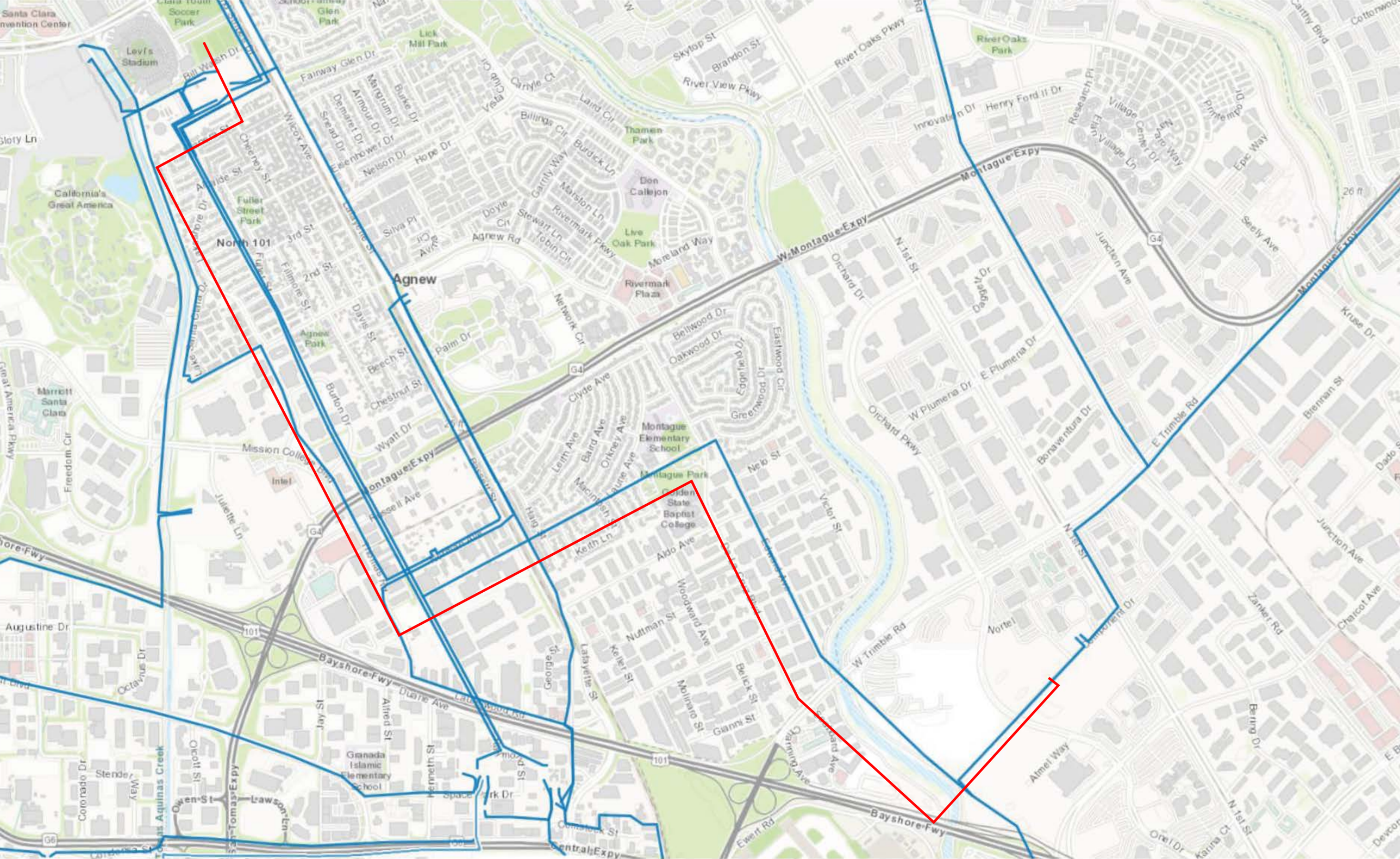
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Innovation Dr
Henry Ford II Dr
Research Pl
Village Center Dr
Village Ln
Printemps Dr
Epic Way
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Junction Ave
Kruse Dr
Glory Ln
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Great America Pkwy
Freedom Cir
Mission College Blvd
Intel
Juliette Ln
Bassett St
Bayshore Fwy
Augustine Dr
Octavius Dr
Coronado Dr
Stender Way
Owen St
Lawson Ln
San Tomas Expy
Central Expy
Granada Islamic Elementary School
Jay St
Alfred St
Kenneth St
Diane Ave
Lafayette St
George St
Montague Elementary School
Montague Park
Golden State Baptist College
Aldo Ave
Keith Ln
Woodward Ave
Nutman St
Keller St
Molinaro St
Belick St
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Nejo St
Victor St
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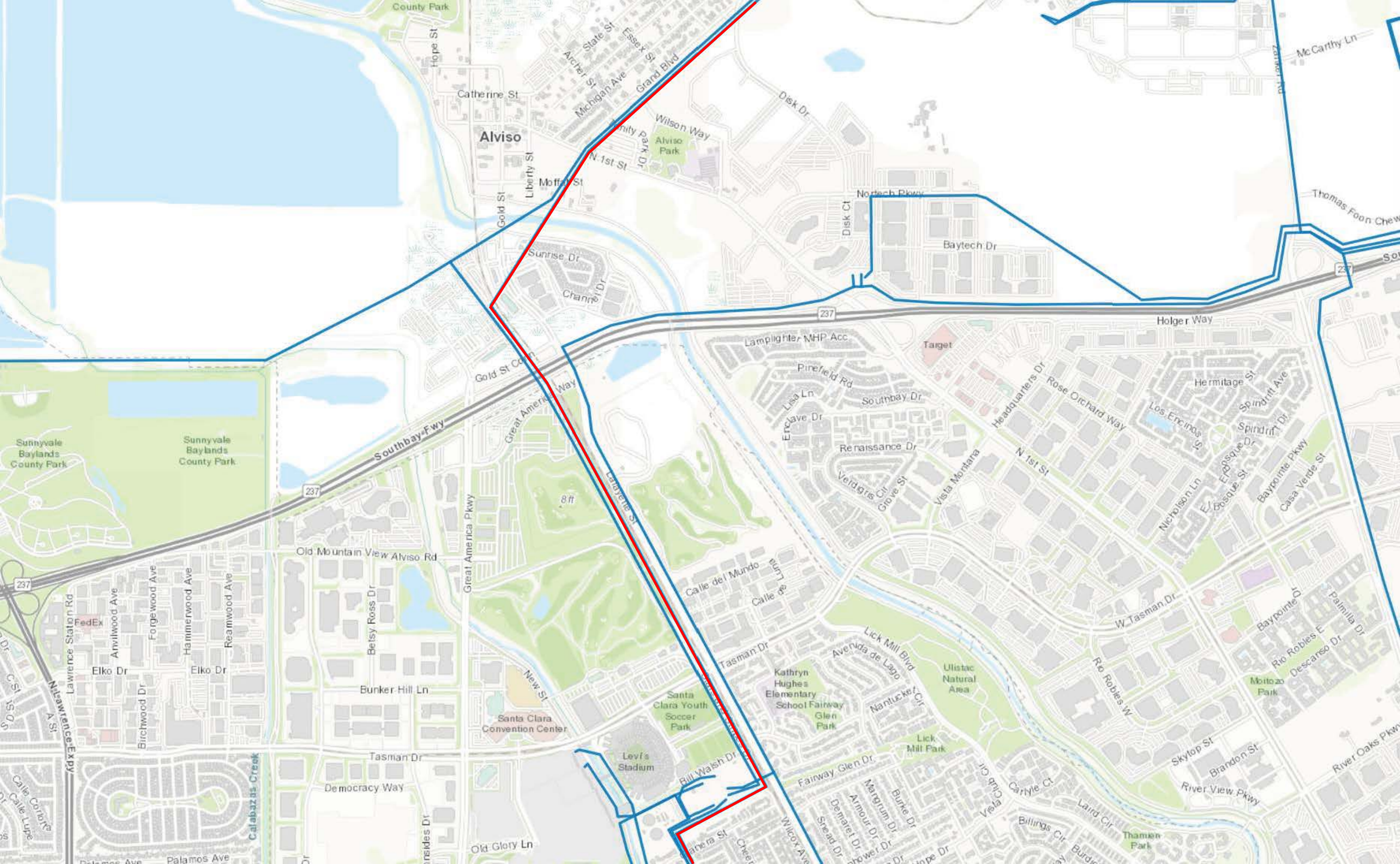
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Enclave Dr
Southbay Dr
Headquarters Dr
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Los Encinos
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Renaissance Dr
Veridgris Cir
Glove St
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Southbay Fwy
Sunnyvale Baylands County Park
Lafayette St
8 ft
Great America Pkwy
Old Mountain View Alviso Rd
Calle del Mundo
Calle de Luna
W Tasman Dr
Tasman Dr
Lick Mill Blvd
Avenida de Lago
Kathryn Hughes Elementary School
Fairway Glen Park
Nantucket Cir
Ulistac Natural Area
Rio Robles W
Rio Robles E
Baypointe Dr
Palmilla Dr
Descanso Dr
Moitoza Park
Skytop St
Brandon St
River View Pkwy
River Oaks Pkwy
Lawrence Station Rd
FedEx
Anvilwood Ave
Forgewood Ave
Hammerwood Ave
Reamwood Ave
Elko Dr
Birchwood Dr
Betsy Ross Dr
Bunker Hill Ln
Lawrence Expy
Calabazas Creek
Democracy Way
Santa Clara Convention Center
New St
Santa Clara Youth Soccer Park
Levi's Stadium
Bill Walsh Dr
Fairway Glen Dr
Margrum Dr
Armour Dr
Demaret Dr
Snead Dr
Burke Dr
Vela Club Cir
Carlyle Ct
Laird Cir
Billings Cir
Thamien Park
Wilcox Ave
Old Glory Ln
Palamos Ave
Calle Corlora
Calle Lupe

North San Jose
Grand Blvd
Speckles Ave
Wabash St
Alviso Marina County Park
Hope St
State St
Essex St
Archer St
Michigan Ave
Grand Blvd
Catherine St
Alviso
Disk Dr
Wilson Way
Los Esteros Rd
McCarthy Ln
4 ft

Union Pacific

Landing Rd

Clipper Ct

Bayside Pkwy

Seabridge Dr

Gateway Blvd

Bayview Dr

Mud Slough

8 ft

Coyote Creek

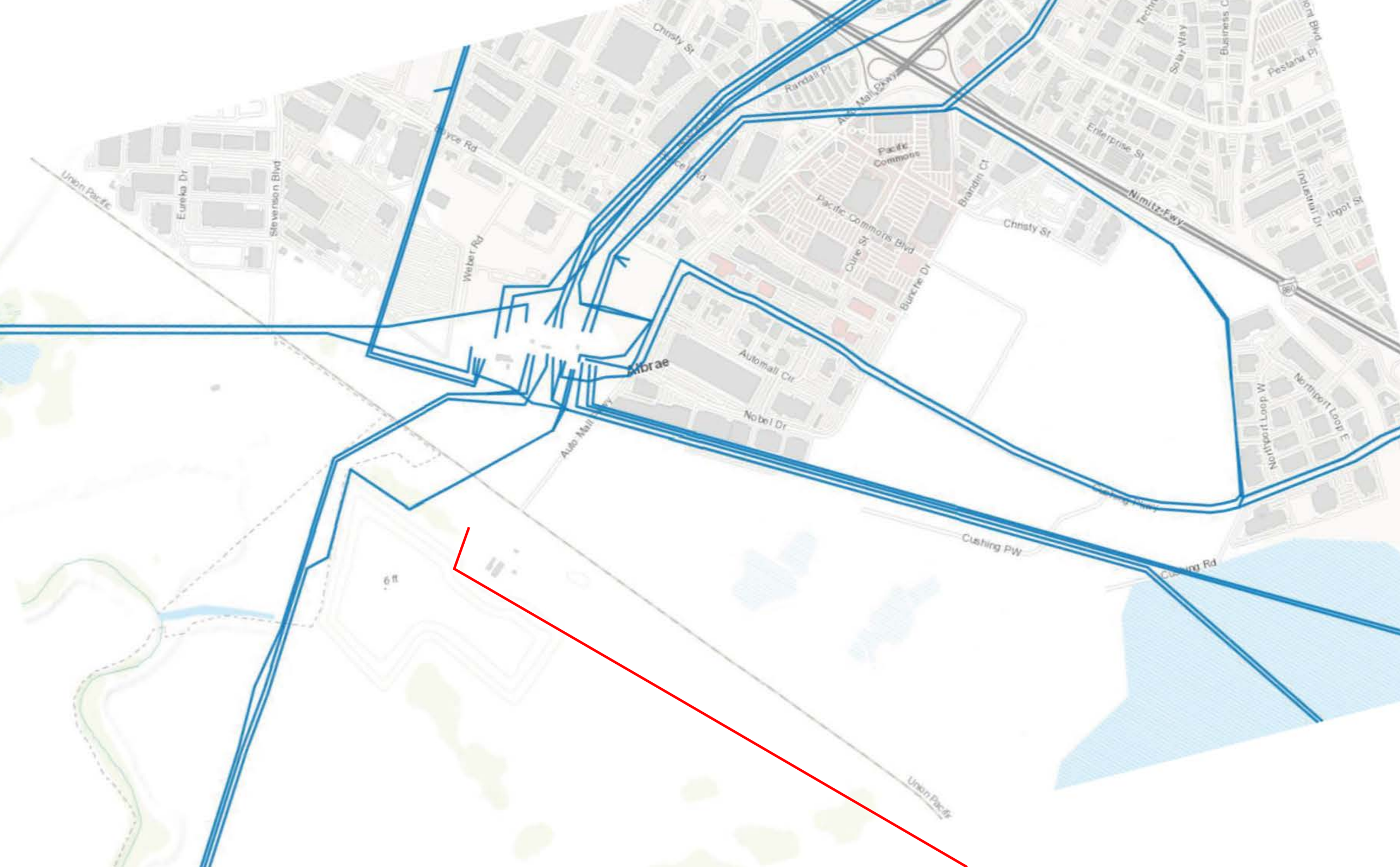
ALAMEDA

SANTA CLARA

SANTA CLARA

6 ft

7 ft


Christy St
Randall Pl
Auto Mall Pkwy
Pacific Commons
Brandin Ct
Enterprise St
Solar Way
Business Cir
Pestana Pl
Technology Blvd
Nimitz Fwy
Christy St
Pacific Commons Blvd
Curie St
Burdette Dr
Industrial Dr
Ingot St
Northport Loop W
Northport Loop E
Fortune Dr
Bryce Rd
Weber Rd
Stevenson Blvd
Eureka Dr
Union Pacific
Milpitas
Automall Cir
Nobel Dr
Auto Mall Pkwy
Cushing PW
Cushing Rd
Union Pacific
6 ft

ATTACHMENT HAZ DR-116

FAA Notice of Determination of No Hazards for Temporary Structures

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2024-AWP-4237-OE

Issued Date: 04/16/2024

Adam McKnight
Microsoft-WA
1 Microsft Way
Redmond, WA 98052

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane SJC04-17A
Location:	San Jose, CA
Latitude:	37-22-39.90N NAD 83
Longitude:	121-55-59.53W
Heights:	32 feet site elevation (SE)
	148 feet above ground level (AGL)
	180 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of a structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Air Missions (NOTAM).

If we can be of further assistance, please contact Justin Hetland, at (847) 294-8084, or justin.hetland@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2024-AWP-4237-OE.

Signature Control No: 617212957-619119715 (TMP)
Eric F Johnston
Manager, Obstruction Evaluation Group

Additional Condition(s) or Information for ASN 2024-AWP-4237-OE

Proposal: To construct and/or operate a(n) Crane to a height of 148 feet above ground level, 180 feet above mean sea level.

Location: The structure will be located 0.91 nautical miles north of SJC Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

It is required that the manager of NORMAN Y MINETA SAN JOSE INTL, (408) 277-5100 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of San Jose ATCT, 408-291-2601 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

This determination expires on 10/16/2025 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2024-AWP-4237-OE

Sectional Map for ASN 2024-AWP-4237-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2024-AWP-4238-OE

Issued Date: 04/16/2024

Adam McKnight
Microsoft-WA
1 Microsft Way
Redmond, WA 98052

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane SJC04-18A
Location:	San Jose, CA
Latitude:	37-22-38.33N NAD 83
Longitude:	121-55-56.72W
Heights:	32 feet site elevation (SE)
	148 feet above ground level (AGL)
	180 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of a structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Air Missions (NOTAM).

If we can be of further assistance, please contact Justin Hetland, at (847) 294-8084, or justin.hetland@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2024-AWP-4238-OE.

Signature Control No: 617212958-619119716 (TMP)
Eric F Johnston
Manager, Obstruction Evaluation Group

Additional Condition(s) or Information for ASN 2024-AWP-4238-OE

Proposal: To construct and/or operate a(n) Crane to a height of 148 feet above ground level, 180 feet above mean sea level.

Location: The structure will be located 0.88 nautical miles north of SJC Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

It is required that the manager of NORMAN Y MINETA SAN JOSE INTL, (408) 277-5100 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of San Jose ATCT, 408-291-2601 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

This determination expires on 10/16/2025 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2024-AWP-4238-OE

Sectional Map for ASN 2024-AWP-4238-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2024-AWP-4239-OE

Issued Date: 04/16/2024

Adam McKnight
Microsoft-WA
1 Microsft Way
Redmond, WA 98052

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane SJC04-19A
Location:	San Jose, CA
Latitude:	37-22-40.10N NAD 83
Longitude:	121-55-55.24W
Heights:	32 feet site elevation (SE)
	148 feet above ground level (AGL)
	180 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

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A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Air Missions (NOTAM).

If we can be of further assistance, please contact Justin Hetland, at (847) 294-8084, or justin.hetland@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2024-AWP-4239-OE.

Signature Control No: 617212959-619119717 (TMP)
Eric F Johnston
Manager, Obstruction Evaluation Group

Additional Condition(s) or Information for ASN 2024-AWP-4239-OE

Proposal: To construct and/or operate a(n) Crane to a height of 148 feet above ground level, 180 feet above mean sea level.

Location: The structure will be located 0.9 nautical miles north of SJC Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

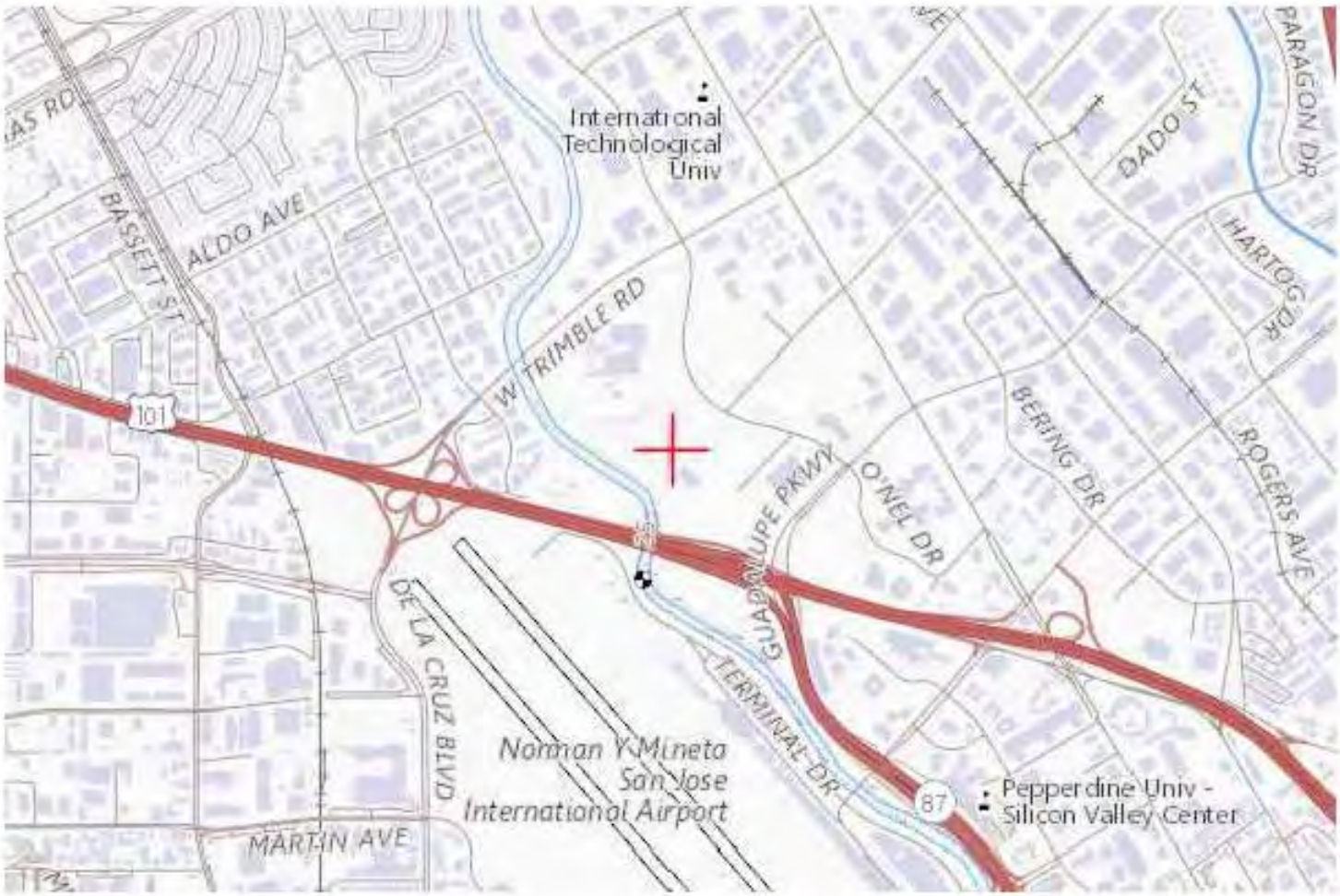
It is required that the manager of NORMAN Y MINETA SAN JOSE INTL, (408) 277-5100 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of San Jose ATCT, 408-291-2601 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

This determination expires on 10/16/2025 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2024-AWP-4239-OE



Sectional Map for ASN 2024-AWP-4239-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2024-AWP-4240-OE

Issued Date: 04/16/2024

Adam McKnight
Microsoft-WA
1 Microsft Way
Redmond, WA 98052

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane SJC04-20A
Location:	San Jose, CA
Latitude:	37-22-41.58N NAD 83
Longitude:	121-55-58.14W
Heights:	32 feet site elevation (SE)
	148 feet above ground level (AGL)
	180 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

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This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Air Missions (NOTAM).

If we can be of further assistance, please contact Justin Hetland, at (847) 294-8084, or justin.hetland@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2024-AWP-4240-OE.

Signature Control No: 617212960-619119714 (TMP)
Eric F Johnston
Manager, Obstruction Evaluation Group

Additional Condition(s) or Information for ASN 2024-AWP-4240-OE

Proposal: To construct and/or operate a(n) Crane to a height of 148 feet above ground level, 180 feet above mean sea level.

Location: The structure will be located 0.93 nautical miles north of SJC Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

It is required that the manager of NORMAN Y MINETA SAN JOSE INTL, (408) 277-5100 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of San Jose ATCT, 408-291-2601 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

This determination expires on 10/16/2025 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2024-AWP-4240-OE

Sectional Map for ASN 2024-AWP-4240-OE